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Knowledge of Safe use of Agricultural Pesticide and Application of Safety Measures by Farmers in Tulkarm Governorate

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Dedication

This work is dedicated to

My father soul,

A woman of great strength and love
(my mother),

Whose support, encouragement, and love made this work possible
(My wife and my sons),

My brothers and sisters and every one of my relatives,

Supervisors of this thesis,

My university "An-Najah National University" which is continuously improving the research.

and
All researchers who are working to improve the
quality of life.

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الإقرار

أنا الموقع أدناه، مقدم الرسالة التي تحمل العنوان:

مدى المعرفة بالاستخدام الآمن للمبيدات الزراعية وتطبيق اجراءات السلامة لدى المزارعين في محافظة طولكرم

Knowledge of Safe use of Agricultural Pesticide and Application of Safety Measures by Farmers in Tulkarm Governorate

اقر بأن ما اشتملت عليه هذه الرسالة إنما هي نتاج جهدي الخاص، باستثناء ما تمت الإشارة إليه حيثما ورد، وان هذه الرسالة ككل، أو أي جزء منها لم يقدم من قبل لنيل أية درجة علمية أو بحث علمي أو بحثي لدى أية مؤسسة تعليمية أو بحثية أخرى.

Declaration

The work provided in this thesis unless otherwise referenced, is the researcher's own work, and has not been submitted elsewhere for any other degree or qualification.

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Abstract

The abundant and intensive use of pesticides has led to many problems worldwide. This descriptive and statistical study is aiming at assessing the knowledge about the use of agricultural pesticide and the safety measures among the farmers in Tulkarm governorate. The sample of 350 farmers, of which 79% are males and 21% are females were subject to a questionnaire from which the response rate was 100%.

The results showed that 71.1% of the farmers faced agriculture problems; the most common of which are different crops diseases. 96% of the farmers used pesticides, mainly Confidor. 91.7% stick to the recommended pesticide's dose and 83.1% used to read the information on the pesticide card and follow the instructions. 59.1% of the farmers are not trained for safety measures while 56.9% participants did not attend courses to raise awareness about the dangers of pesticides. Moreover, 62.6% are not trained in integrated pest management, insect and disease identification and prevention, while 72.3% looked for information to develop their knowledge about pesticides. In addition, 72% of the farmers sought to take courses on the safe use of pesticides and 85.1% expressed their interest in knowing

appropriate solutions to reduce the excessive use of pesticides. The statistical analysis showed that there is significant difference between the geographical location of the farms and the statistical parameters: using pesticides, knowing the amount of applied pesticides, calculate the required dose, adhere to the recommended dose, placing a warning sign on the field, check spray equipment before using, and using mixing tools.

There is also significant difference between education level of the farmers and reading the information on the pesticide card, following the instructions, reading the pesticide label, calculate the required dose; conform the expiration date, clean the spray tools, washing hands, and change clothes after spraying. Statistical difference between farmer's age and use hands to mix without protection is also significant. Between the gender of the farmers and placing a warning sign on the field sprayed with pesticides or where the pesticides are, use PPE when dealing with pesticides and chemicals and use hands to mix without protection there is also a significant difference.

The training provided by governmental organization and NGOs to the farmers has also significant difference with placing warning signs on the field or where the pesticides are, using PPE when dealing with pesticides and chemicals, mixing with hands without protection, examination of insect and disease samples before using the pesticide, and adhere to the pre-harvest interval period.

Keywords: Pesticides, Safety Measures, PPE, Tulkarm Governorate.

Chapter One

Introduction

1.1 Background

Humans knew pesticides a long time ago. Ancient civilizations used certain materials and applied them to crops to reduce insect infestation or minimize the damage caused by insects to plants.

Pesticides are mainly used to increase crop productivity by managing the pest population. The most commonly used pesticide are synthetic chemical products, which are generally used to protect plants from the harmful effects of different pests, such as weeds, pathogens or insects (Mohammed, Bader EL-Din, Sadek, & Mohammed, 2018). The use of pesticides has increased dramatically since the 1960s. In 2007 the French Ministry of Agriculture estimated that 2.4 billion kg of active pesticide compounds were applied worldwide (French Ministry of Agriculture, 2014).

The use of pesticides worldwide has increasingly become necessity to produce high quantity and quality of crops to meet global demand. However, the abundant and intensive use of pesticides has led to many problems worldwide: environmental problems, human health concerns, high pesticide residues in food, as well as increased production costs.

The environmental effects of pesticides include air and soil pollution, contamination of groundwater and loss of beneficial insects and natural enemies as bees, predators and parasites (which has led to widespread and

outbreaks of pest and disease). Despite all these impacts and costs, farmers continue to use pesticides in most countries at an increasing rate, while biological pest control methods are still limited (Wilson & Tisdell, 2001).

Several human health effects associated with the use of pesticides have been reported directly, such as; poisoning or irritation of the nose, throat, and skin causing burning, stinging and itching as well as rashes and blisters. Nausea, dizziness and diarrhea are also common, or on long term human diseases development such as; cancer; brain and nervous system damage; congenital disabilities; infertility and related reproductive problems; and damage to the liver, kidneys, lungs and other body organs (Californians for Pesticide Reform, 2020). Humans could be exposed to pesticides during the handling, application, manufacturing and transportation of pesticides as well as when consuming agricultural products contaminated with pesticides. Most pesticides will cause harmful effects if they are ingested accidentally or intentionally or touch the skin for a long time. Pesticide particles may be inhaled with air during spraying application. There is additional risk by the contamination of drinking water or food (World Health Organization, 2000).

People who work with pesticides must receive appropriate training on safe handling and application of pesticides (World Health Organization, 2000). According to the accident records issued by the Health and Safety Authority, a farmer is seven times more likely to be seriously harmed at work compared to other workers in any field or business sector. Older

people and young children are particularly at higher risk of being injured or killed (Aviva Insurance Limited, 2014).

Special precautions must be taken during transport, storage and handling of pesticides. Spray equipment should be cleaned regularly and maintained to prevent leakage. Pesticides will not be hazardous to humans and non-target animal species if appropriate precautions are applied.

Personal protective equipment does not prevent the accident but may reduce the harmful effects on human. Therefore, the personal protective equipment must be carefully chosen and tested to see how well it can ensure prevention for those who use it.

The unsafe and intensive use of pesticides in agriculture causes a significant risk to human health and environment. Changing the legislation, applying integrated pest management and genetically modified crops in the agricultural production systems are still not efficient in reducing the huge pesticides usage. Especially under the pressure of increasing the demands on agricultural products to meet the population growth, pesticide resistance by pests, economic factors, and the high cost of the alternative environmentally friendly pest controls measures (Abbassy, 2017).

1.2 Research questions

This research aims to shed light and deeply investigate and document the current farmer's knowledge and the most commonly applied practices of handling and using pesticides among Palestinian farmers in Tulkarm

governorate as a representative case study. Therefore, the following questions were highlighted and answered by farmers.

- What is the level of farmers' knowledge about pesticide safety applications in Tulkarm governorate?
- Are the farmers in Tulkarm governorate applying safety practices (including the adoption of personal protective equipment) when handling pesticides?
- What are the farmers implemented practices related to disposal, storage and handling of pesticides?
- What are the main obstacles facing farmers in Tulkarm governorate?

1.3 Problem statement

The use of pesticides for effective pest control is regulated in a way that the safety limits are not reached when applying according to the good agricultural practices. Environmental contamination, water contamination, air pollution, aquatic habitat as well as human health are endangered due to intensive pesticides application, poor equipment, lack of safety measures, pesticide misuse, poor extension services and the absence of strong policies for pesticide (Amuoh, 2011).

Globally, there are many cases of pesticide poisoning, which claimed the lives of many due to the misuse of pesticides, lack of awareness of its seriousness, non-compliance with the recommended dose and safety periods, and non-compliance with safety procedures & practices when

dealing with pesticides, including the use of personal protective equipment, disposal of empty containers and quick actions to be taken if being poisoned, all this In light of the weakness of extension services in the field of pesticides (Damalas & Eleftherohorinos, 2011).

The presence of pesticides ubiquity makes it imperative to conduct high quality studies of these chemicals. Pesticides have been linked to numerous adverse health outcomes, including cancer, non-malignant respiratory disease, neurological outcomes and developmental issues (French Ministry of Agriculture, 2014).

In Palestine, now the study of pesticides and their impact on human health and environment is considered one of the most important and high priority issues, due to its significant role directly influencing the health of Palestinian as well as other living organisms.

Tulkarm governorate is considered an important agricultural area in Palestine, and a main producer for vegetables in the local market. Like in many other Palestinian areas, intensive and increasing amounts of pesticides are currently used. With a lack of actual information and scientific research data about pesticide knowledge and safety practices among farmers (Isaac & Hrimat, 2007).

This study focused and sheds light on this serious problem, in order to contribute in the protection of farmers and agricultural workers and their families from exposure to the danger of pesticides. Moreover, to reinforce

the capabilities of farmers to follow safety and security practices. In addition to protecting agricultural products from pollution, as well as increase the rate of gross domestic product in the Palestinian economy, as a result of increase agricultural production and protecting the agricultural environment from pollution.

This study will help policy makers for an in-depth understanding of the current situation on pesticide application and misused application in order to prompt policy-makers to take action.

1.4 Research hypotheses

A. Geographical location

The Main Hypothesis (H01): There is no significant impact of geographical location on the farmer's knowledge on safe use of agricultural pesticides and safety measures implementation at the level of ($\alpha \leq 0.05$).

B. Education level

H02: There is no significant impact of farmer's education level on the knowledge of safe use of agricultural pesticides and safety measures implementation at the level of ($\alpha \leq 0.05$).

C. Farmers age

H03: There is no significant impact of farmer's age on the knowledge of safe use of agricultural pesticides and safety measures implementation at the level of ($\alpha \leq 0.05$).

D. Gender differences

H04: There is no significant impact of gender differences on the farmer's knowledge on safe use of agricultural pesticides and safety measures implementation at the level of ($\alpha \leq 0.05$).

E. Endogenous knowledge (Pesticide use knowledge, attitude and practices)

Lack of user previous knowledge on pesticide type and toxicity are some of the current major issues associated with the pesticide misuse.

H05: There is no significant impact of farmer's endogenous knowledge on pesticide application and the farmer's knowledge on safe use of agricultural pesticides and safety measures implementation at the level of ($\alpha \leq 0.05$).

F. Training services provided by governmental organization

H06: There is no significant impact of training provided by governmental organization on the knowledge of safe use of agricultural pesticides and safety measures implementation at the level of ($\alpha \leq 0.05$).

G. Training provided by nongovernmental organization

H07: There is no significant impact of training provided by nongovernmental organization on the knowledge of safe use of agricultural pesticides and safety measures implementation at the level of ($\alpha \leq 0.05$).

1.5 Objectives

The general objective of this study was to assess the agricultural pesticide knowledge and application of safety measures among farmers in Tulkarm governorate. Moreover; this study will:

- Compare the level of knowledge on safety measures of pesticide application among farmers in four localities in Tulkarm governorate (Asharaweyah, wadi ashaeer, kafryat and the city and its suburb).
- Describe the agricultural situation in Tulkarm governorate.
- Assess farmers practices that related to disposal, storage and handling of pesticides; evaluate the protective measures taken by farmers, including the adoption of personal protective equipment, to reduce pesticide exposure.
- Identify the obstacles facing farmers in Tulkarm governorate.

1.6 Context of the study

1.6.1 Study area

The area of Tulkarm governorate is 246.5 km^2; (Palestinian Central Bureau of Statistics, 2017). *See Annex 11*. Tulkarm is located in the central west of Palestine, in the north of the West Bank and in the eastern part of the coastal plain of Palestine. It is located about 15 km from the Mediterranean coast, also located southwest of Jenin and northwest of Nablus. 120 m above sea level, as well as it is located at geographical latitude 9-532 north

of the equator, and geographic longitude 1-535 east of Greenwich. The lands of Tulkarm constitute a separation between the territory of the Palestinian National Authority and the Palestinian territories occupied since 1948 (Tulkarem Municipality, 2018).

It is characterized by its location on the boundary between the fertile coastal plain at the west of the city and the mountainous lands that extend to the east of the city. The city's land is distributed between the plain areas, which constitute about 40%, and the mountainous areas, which make up 60% of the total area of Tulkarm. Thus, part of these lands is used for agriculture and grazing, while the other part is used in housing and construction (Tulkarem Municipality, 2018).

Tulkarm is characterized by a subtropical climate, the average temperature in winter is 8-16 C^{o} and in summer is 17-30 C^{o}. Humidity is 69.6% in winter, but in summer months it is wet with medium humidity 70.3% (Palestinian Central Bureau of Statistics, 2011).

1.6.2 Agriculture context

Tulkarm governorate is famous for its fertile lands and the interest of its people in agriculture; where they depend on agriculture for their livelihoods.

Agriculture is considered as one of the most important economic tributaries of the governorate; this sector absorbs many of the labor force, which reduces the prevalence of unemployment among the workers, reflecting an

improvement in the economic life cycle among the community (Al-Hewiti, 2017).

There are many agricultural crops in Tulkarm, the most famous are:

- Olive: The area of land planted with olive trees is about 119711 dunums. Olive trees made up 95% of the cultivated horticulture trees in Tulkarm.
- Greenhouses: The area of agricultural land for greenhouses about 8000 dunums.
- Citrus: The area of land planted with citrus in Tulkarm Governorate is about 5200 dunums.
- Field Crops: includes wheat, barley, lentils, onions, okra and many other crops; the area planted with field crops is about 6400 dunums. (Rainfed constitute 79% and irrigated 21% of the total field land area).
- There are agricultural crops that have become widespread recently and the farms are interested in cultivating it, such as: mangoes, avocados, walnuts, java and thyme plantation, which are spread in most of the plains of Tulkarm.
- Almonds: such as almond, cherry and apricot trees. (Al-Hewiti, 2017).

Reasons for the decline in the area of agricultural land in Tulkarm:

- First: The Israeli Occupation Practices on the Land: The crimes of the occupation against the land and the citizen:

  A. The Israeli occupation erected the separation wall west of Tulkarm.

  B. The Israeli occupation has established settlements on citizens' lands in Tulkarm.

- Second: Despite the abundance of water resources, the Israeli occupation imposed severe restrictions on how to exploit the water and imposed strict control on the artesian wells in the governorate, where monitor and restrict the amount of water pumped for the benefit of the farmer and the Palestinian citizen. The occupation also exploited the water basin located behind the wall on the lands of Tulkarm, in addition to isolating about 5 artesian wells behind the wall.

- Third: the urban expansion due to the continuous increase in the population.

- Fourth: Establishing economic projects on agricultural lands.

- Fifth: Lack of awareness among farmers. (Al-Hewiti, 2017).

Chapter Two

Theoretical Framework & Literature Review

Agricultural products are infected by various pests that destroy the crops. They account to huge loss of crop yields. This result is suffering for both the farmer and the workers. It becomes important for both the farmer and his workers to work together to ensure that crops are not destroyed. It is also important that they both work together to ensure that in the course of work activities workers are not exposed to risks that may cause ill health, injuries and even death. Therefore, the knowledge and understanding of pesticides used in agriculture is an important step in applying good health and safety standards (Department of employment and labour in South Africa, 2016).

The application of pesticides affects workers and their families. Since most farm workers and their families live on the farms or near the farms. Environmental problems are also caused by use, overuse or misuse of these pesticides (Department of employment and labour in South Africa, 2016).

A. Theoretical framework

2.1 Definition of pesticides

Pesticides: Are substances intended to prevent, disease or control in plants or animals' disease and pests, including vectors of human and animal diseases, unwanted species of plant, or to control the behavior or physiology of pests or crops during production or storage. They include

insecticides herbicides, fungicides, acaricides, termiticides and rodenticides and other substances (FAO, 2010)**.**

2.2 Reasons for pesticides intensive use

- Rapid Impact: Agricultural pesticides are characterized by rapid action and directly affect pests, even if they have negative effects later, but their direct and rapid impact affects pests and eliminates them as soon as possible if used according to the correct guidelines set for them.

- Cheap price: Pesticides are cheap agricultural supplements that farmers resort to periodically, and are available in large quantities due to the proliferation of companies producing them, as well as scientific advances that have been able to integrate these elements and chemical components easily. In addition, biological evolution has discovered many pesticides that work for the same purpose, making competition among producers and making pesticides more affordable than they used to be.

- Easy to use: It is known that pesticides are easy to use and do not need someone specializing in agricultural sciences or agricultural engineering to deal with them, and the illiterate farmer can be use it in the quantities set by the agricultural guide, taking into account the appropriate times for spraying.

- Accessibility: Pesticides are widely available in various agricultural associations, institutions, agencies and entities specialized in

agriculture around the world, whatever their name, which makes their access very large and available to the farmer around the clock, in addition, the ministries of agriculture are keen to provide pesticides to the farmer and to deliver it as much as possible to ensure the production of a good exportable crop and to generate a hard currency for the country. (Menna, 2008).

2.3 Classification of pesticides

- **The classification based on the basis of use can be as follows:**

Acaricides, Algicide, Antifeedants, Avicides, Bactericides, Bird repellents, Chemosterillant, Fungicides, Herbicide softeners, Herbicides, Insect attractants, Insect repellents, Insecticides, Mammal repellents, Mating disrupters, Molluscicides, Nematicides, Plant activators, Plant growth regulators, Rodenticides, Synergists, Virucides and Miscellaneous.

Acaricides: are the substances that are used to kill mites and ticks, or to disrupt their growth or development. And some of the examples are DDT, dicofol, carbofuran, methiocarb, Propoxur, abamectin, milbemectin, flufenoxuron, chlorpyrifos, oxydemeton methyl, Phorate, Phosalone, fenpyroximate, Fipronil, bifenthrin, cyhalothrin, fluvalinate, permethrin, and chlorfenapyr.

Algicide: are the substances that are used to kill or inhibit algae. Some of the examples are copper sulfate, diuron, isoproturon, isoproturon, oxyfluorfen, and simazine.

Antifeedants: are the chemicals which prevent an insect or other pest from feeding. Some of the examples are chlordimeforn, fentin and azadirachtin.

Avicides: are the chemicals that are used to kill birds. Some of the examples are fenthion, and strychnine.

Bactericides: are the compounds that are isolated from or produced by a microorganism (e.g. a bacterium or a fungus), or a related chemical that is produced artificially. Which are used to kill or inhibit bacteria in plants or soil. Some of the examples are copper hydroxide, kasugamycin, streptomycin, and tetracycline.

Bird repellents: are the chemicals which act as the bird repellants. Some of the examples are copper oxychloride, diazinon, methiocarb, thiram, and ziram.

Chemosterillant: are the chemicals that renders an insect infertile and thus prevents it from reproducing. Some insects that mate only once can be controlled or eradicated by releasing huge numbers of sterilized insects, which act as sterilizing substances for the insects. All of these acts in one of the three ways: (a) They inhibit the production of egg or spam. If it fails then go to the second stages; (b) Cause death of the spam or eggs; (c) If these steps are failed totally then these bring about lethal mutation on the spam or eggs material and severally damage the genetic material and chromatin material of eggs and spam. This produce zygote, but the off springs will totally lose their reproduction ability. (e.g. diflubenzuron).

Fungicides: are the chemicals which are used to prevent, cure eradicate the fungi. Some of the examples are cymoxanil, carpropamid, metalaxyl, metalaxyl-M, carboxin, aureofungin, kasugamycin, streptomycin, validamycin, kasugamycin, carbendazim, thiabendazole, thiophanate-methyl, cyproconazole, difenoconazole, flusilazole, tebuconazole, triadimefon, Bordeaux mixture, copper oxychloride, iprodione, captan, ferbam, thiram, ziram, mancozeb, maneb, metiram, propineb, zineb, isoprothiolane, tridemorph, edifenphos, fosetyl-Al, fenarimol, and tricyclazole.

Herbicide softeners: A chemical that protects crops from injury by herbicides, but does not prevent the herbicide from killing weeds. Examples are benoxacor, cloquintocet, cyometrinil, and cyprosulfamide

Herbicides: are the substances that are used to kill plants, or to inhibit their growth or development. Some of the examples are alachlor, butachlor, metolachlor, pretilachlor, methabenzthiazuron, pendimethalin, oxyfluorfen, imazethapyr, anilofos, glyphosate, oxadiargyl, oxadiazon, 2,4-D, clodinafop, cyhalofop, quizalofop, Paraquat, atrazine, isoproturon, linuron, metoxuron, chlorimuron, and sulfosulfuron.

Insect attractant: A chemical that lures pests to a trap, thereby removing them from crops, animals or stored products. Examples are Gossyplure, Gyplure, and Muscalure (name ends with lure as they lure the pests).

Insect repellents: A chemical that deters an insect from landing on a human or an animal. Some of the examples are Citronella oil, and Permethrin.

Insect Growth regulator: A substance that works by disrupting the growth or development of an insect. Some of the examples are. Diflubenzuron, and buprofezin.

Insecticides: A pesticide that is used to kill insects, or to disrupt their growth or development. Some of the examples are azadirachtin, pyrethrins, carbofuran, carbosulfan, methomyl, buprofezin, diflubenzuron, fenoxycarb, abamectin, emamectin, milbemectin, spinosad, cartap, clothianidin, imidacloprid , thiamethoxam, Acetamiprid, Thiacloprid, DDT, Lindane, Endosulfan, dichlorvos, monocrotophos, phosphamidon, demeton-O-methyl, Ethion, Malathion, phorate, Dimethoate, Phosalone, azinphos-methyl, chlorpyrifos, pirimiphos-methyl, quinalphos, triazophos, cyfluthrin, cyhalothrin, lambda-cyhalothrin, cypermethrin, alpha-cypermethrin, cyphenothrin, deltamethrin, fenpropathrin, esfenvalerate, fluvalinate, imiprothrin, tofenprox, chlorfenapyr, clothianidin thiamethoxam, Thiacloprid, and isoprothiolane.

Mammal repellents: A chemical that deters mammals from approaching or feeding on crops or stored products.

Mating disrupters: are the chemicals that interfere with the way that male and female insects locate each other using airborne chemicals (pheromones), thereby preventing them from reproducing.

Molluscicides: are the substances used to kill slugs and snails. Some of the examples are copper sulfate, metaldehyde, thiacloprid, and thiodicarb.

Nematicides: are the chemicals which are used to control Nematicides. Some of the examples are abamectin, benomyl, carbofuran, carbosulfan, methyl bromide, fenamiphos, phosphamidon, chlorpyrifos, dimethoate, phorate, and triazophos.

Plant growth regulators: are the substances that alters the expected growth, flowering or reproduction rate of plants. Fertilizers and other plant nutrients are excluded from this definition. Some of the examples are 2,4-D, α-naphthaleneacetic acid, ethephon, metoxuron, gibberellic acid, chlormequat, paclobutrazol, and triacontanol.

Rodenticides: are the substances used to kill rats and related animals. Some of the examples are strychnine, bromadiolone, coumachlor, coumatetralyl, warfarin, zinc phosphide, Lindane, and aluminium phosphide.

Synergists: A chemical that enhances the toxicity of a pesticide to a pest, but that is not by itself toxic to the pest. Example: piperonyl butoxide.

Virucide: an agent having the capacity to destroy or inactivate viruses. Example: Ribavirin.

Miscellaneous: aluminium phosphide, and sodium cyanide.

Biologicals: Viruses, bacteria, fungi, and plants Nematodes, insects and other parasites or predators.

(National Institute of Plant Health Management "NIPHM", 2011).

- **Classification on the basis of the chemistry**

A large number of group of chemicals are available in the list pesticides but the researcher will be confined to the most common pesticides.

a) Insecticides: The insecticides can be classified as Oregano halogen, Organophosphorous, Carbamates, Pyrethroids, Neonicotinoids, Miscellaneous pesticides, Spinosyns (spinosad), neriestoxin (cartap), Fiproles or Phenylpyrazoles (Fipronil), Pyrroles (chlorfenapyr), Quinazolines (fenazaquin), Benzoylureas (diflubenzuron), Antibiotics (abamectin) etc.

b) Fungicides: The fungicides are aliphatic nitrogen fungicides (dodine), amide fungicides (carpropamid), acylamino acid fungicides (metalaxyl), anilide fungicides (carboxin), antibiotic fungicides (kasugamycin), methoxyacrylate strobilurin fungicides (azoxystrobin), aromatic fungicides (chlorothalonil), carbamate fungicides or benzimidazole fungicides (carbendazim), conazole fungicides (triazoles) (hexaconazole), copper fungicides, dicarboximide fungicides (famoxadone), dichlorophenyl dicarboximide fungicides (iprodione), dinitrophenol fungicides (dinocap), dithiocarbamate fungicides (mancozeb), dithiolane fungicides

(isoprothiolane), morpholine fungicides (tridemorph), Sulphur compounds etc.

c) Herbicides: The herbicides are anilide herbicides (flufenacet), chloroacetanilide herbicides (butachlor), pyrimidinyloxybenzoic acid herbicides (bispyribac), benzothiazoleherbicides (methabenzthiazuron), dinitroanilineherbicides (pendimethalin), nitrophenyl ether herbicides (oxyfluorfen), halogenated aliphatic herbicides (dalapon), imidazolinone herbicides (imazethapyr), organophosphorus herbicides (anilofos), phenoxyacetic herbicides (2,4-D), aryloxyphenoxypropionic herbicides (clodinafop), quaternary ammonium herbicides (Paraquat), chlorotriazine herbicides (atrazine), triazolone herbicides (carfentrazone), Urea herbicides (methabenzthiazuron), phenylurea herbicides (isoproturon), sulfonylurea herbicides (chlorimuron).

d) Rodenticides: Inorganic Rodenticides: (Zinc Phosphide, Aluminium Phosphide, Magnesium Phosphide) coumarin Rodenticides (organic) (bromadiolone, coumachlor, coumatetralyl). (National Institute of Plant Health Management "NIPHM", 2011)

The most common and useful method of classifying pesticide is based on their chemical composition and nature of active ingredients. It is such kind of classification that gives the clue about the efficacy, physical and chemical properties of the respective pesticides. The information on chemical and physical characteristics of pesticides is very useful in determining the mode of application, precautions that need to be taken

during application and the application rates. Based on chemical composition, pesticides are classified into four main groups namely; organochlorines, organophosphorus, carbamates and pyrethrin and pyrethroids. The chemical-based classification of pesticides is rather complex. In general, modern pesticides are organic chemicals (Fig. 1) (Kaur, Mavi, & Ragha, 2019).

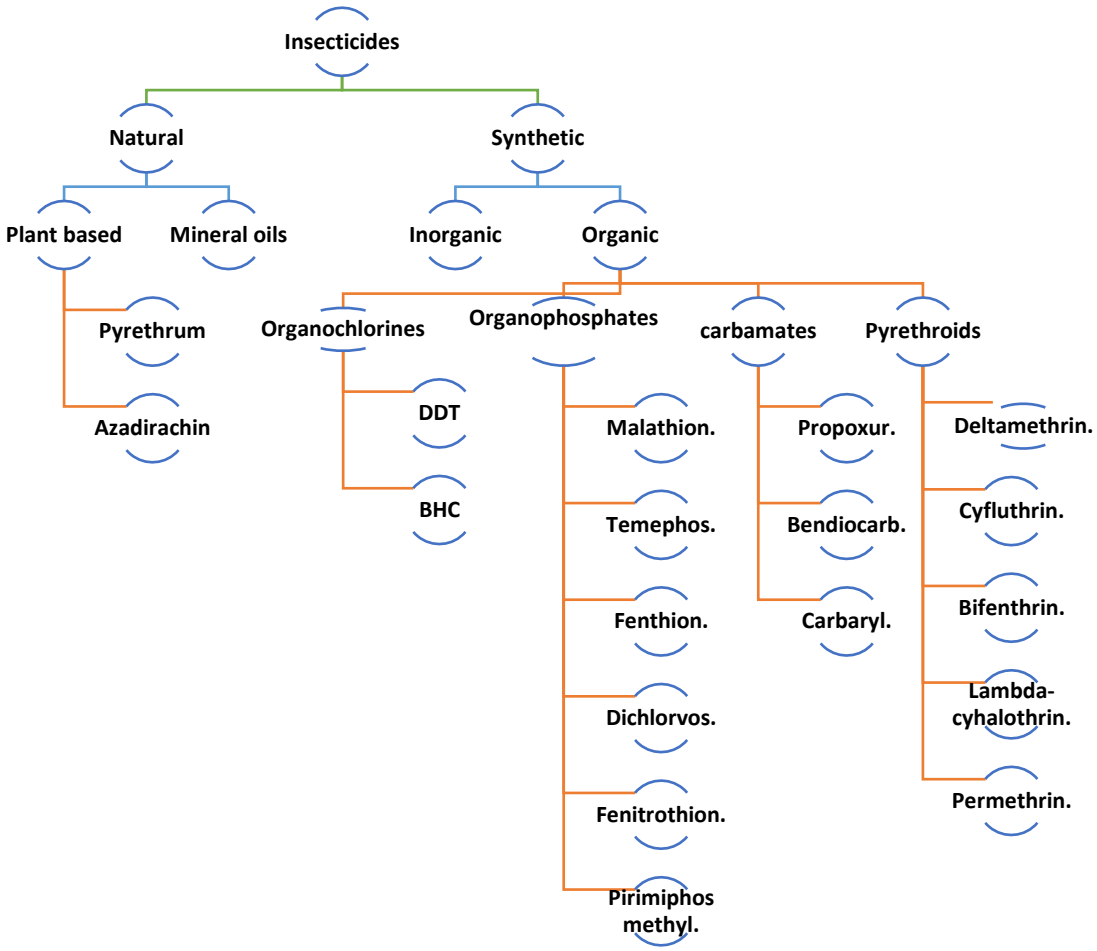

Figure (1): Classification of insecticides.

Source: (Kaur, Mavi, & Ragha, 2019)**.**

The chemical-based classification of pesticides is rather complex. In general, modern pesticides are organic chemicals. They include pesticides of both synthetic and plant origin. However, some inorganic compounds are also used as pesticides. Insecticides are important pesticides that can be further classified into several sub-classes (Kaur, Mavi, & Ragha, 2019).

2.4 Advantages of the use of pesticides

The advantages of the use of pesticides are: Cost effectiveness "inexpensive", crop protection, control pests, greater yields, effective and rapid, increase food supplies, flexibility in using it, used to kill unwanted plants or weeds which is grown in the field, prevention of problems and disease "controlling the growth of mosquitoes which may cause yellow fever or malaria. It is also used to kill houseflies, cockroaches, lice, poisonous insects to prevent disease caused by it", protect stored food grains and it helps to contribute and enhance human health by controlling the disease spread (Frndzzz, 2019).

2.5 Disadvantages of pesticides

The disadvantages of pesticides are: (1) The chemicals used in pesticides are slightly harmful and kills beneficial species of interest and reduces their population. (2) When pesticides are applied to food crops, residues of pesticides may remain on or in food and may be harmful to the body if it is available in higher level. (3) Sometimes pesticides may also eliminate natural enemies of pests such as predators and parasites, leads to increase in population of pests. (4) Promotes genetic resistance. (5) Health risks

to both human as well as animals and different types of organisms; "The pesticides used are hazardous and poisonous which may have toxic effect on infants, children and adults if they come in contact with the body". (6) Ground water contamination. (7) Pollutes the environment in general. and (8) Pesticides may accumulate and enter in food chain (Frndzzz, 2019).

2.6 Major types of pesticides which used in Palestine

(See annexes 1, 2, 3, 4, 5, 6 and 7).

2.7 Toxicological aspect of pesticides

2.7.1 Toxicity of pesticides

Toxicity is the detrimental or adverse effect of any substance or mixture of several substances on the organism. It is divided into:

- Acute toxicity: the harmful effect that occurs to the organism after exposure to the pesticide for a short time and once or multiple times during a short period.

- Sub-acute toxicity: the harmful effect that occurs to the organism as a result of repeated or persistent exposure to the pesticide for 30 to 90 days.

- Chronic toxicity: the harmful effect that occurs to the organism as a result of repeated or persistent exposure to the pesticide longer than half of the life of this organism.

In general, all pesticides can be considered toxic substances, and the degree of toxicity of a pesticide varies depending on the dose and sensitivity of the organism, whether human, plant or animal, as well as the ability to cause poisoning and its severity varies according to age, gender, health status, nutrition and pesticides formulation. It is worth mentioning that the toxicity of the chemical is measured by the Lethal Dose Standard, LD_{50}, which is a dose in mg/kg of body weight that kills 50% of the experimental animal population (Agricultural Pesticides Committee, 2017).

Signs and symptoms of pesticide toxicity

In general: severe weakness and fatigue (El-Nahaal, 2016).

Skin: itching, burning sensation, excessive sweating and appearance of spots.

Eyes: desire to itch, burning sensation, runny tears, vision becomes difficult or unclear and dilated or narrowed pupils.

Digestive system: heartburn, severe salivation, nausea, dizziness, vomiting, abdominal pain and diarrhea.

Nervous system: headache, dizziness, discomfort, twitching of muscles, ataxia seizures, loss of consciousness and difficulty in pronunciation.

Respiratory system: cough, pain, difficulty of breathing and wheezing.

2.7.2 Pesticide residues

Pesticide residues: The quantities or concentrations of pesticides that remain on the surface or inside agricultural and food products after using the pesticides. These concentrations vary according to the type of crop and the type of pesticide. Each pesticide has a pre-harvest interval "safety period". Whilst the pre-harvest interval: It is the minimum time duration, between the last time of application of a pesticide on the crop, and the time it can be harvested. That is, after a pesticide is applied to a crop, a specific number of days must pass before the fruit is harvested (Al-Dossary, 2018).

Pesticides reach food by spraying crops with pesticides. They can be found in food products or on agricultural crops after harvesting or storage. There are maximum permissible limits in the food and agricultural products of these pesticides, and it varies from one pesticide to another and from a crop or food product to another (Al-Dossary, 2018).

2.8 Common wrong practices when use, storage, transport and disposal of pesticides

The most common farmer's wrong practices in Palestine are: Storage of pesticides in nearby the reach of children; Storage of pesticides in an open place without availability of means of prevention and protection; Uncertainty of the pesticide expiry date; Failure of the farmer to read the instructions written on the pesticide packaging or not to abide by them; Mixing several types of pesticides and chemicals with each other to reduce

time and cost; Do not wear personal protective equipment; Smoking during spraying; Use a pesticide amount that exceeds the limit; Spray in the opposite direction of the wind; Use of pesticides at inappropriate times; Use of pesticides even if the crop is not infected with diseases; Sometimes when spraying equipment becomes clogged, some farmers open the equipment with their mouths; The farmer does not bathe after using the pesticide; Improper disposal of empty pesticide containers after spraying such as (dumping them in sewers, burying them under the soil, burning them, throwing them on the edges of the field); and Failure to comply with the pre-harvest interval period (Sawalha, 2012).

2.9 Main types of personal protective equipment

Figure (2): Personal protective equipment.

2.10 Pesticide alternatives

Pesticide alternatives are considered striking changes in the field of plant protection from pests and human protection from the damage caused by chemical pesticide residues and environmental preservation from chemical pollutants in addition to reducing the costs of pest control and increasing crop production (Kandil, 2000).

Advantages of pesticide alternatives, including:

a) It is a biological compounds and natural materials that are not harmful to humans, plants, animals and the environment.

b) Inexpensive compared to chemical pesticides.

c) It begins to be used at levels less than the effect of chemical pesticides and early detection of effect, so spray can be repeated for best results.

d) When using biological compounds, the farmer must be confident that the pest will not die immediately, but need the incubation period within it.

e) The grace period after spraying and harvesting, is almost non-existent.

f) It is the safe and suitable method for culturally different levels in the field of pest control.

g) Repeated use leads to an increase in the natural enemies of pests, which reduces the use of chemical pesticides.

h) Safety of the product and a guarantee for the source where the food is free from chemicals and preserves the environment from pollution.

i) Increase national and individual output as a result of successful control. (Kandil, 2000).

Examples of pesticides alternatives:

Alternatives to pesticides are available and include methods of cultivation, use of biological pest controls (such as pheromones and microbial pesticides), genetic engineering, and methods of interfering with insect breeding (Miller, 2004). Application of composted yard waste has also been used as a way of controlling pests (Gallaher & McSorley, 1996). These methods are becoming increasingly popular and often are safer than traditional chemical pesticides.

Cultivation practices include polyculture (growing multiple types of plants), crop rotation, planting crops in areas where the pests that damage them do not live, timing planting according to when pests will be least problematic, and use of trap crops that attract pests away from the real crop (Miller, 2004). Trap crops have successfully controlled pests in some commercial agricultural systems while reducing pesticide usage; (Shelton & Badenes-Pérez, 2006) however, in many other systems, trap crops can fail to reduce pest densities at a commercial scale, even when the

trap crop works in controlled experiments (Holden, Ellner, Lee, Nyrop, & Sanderson, 2012).

Release of other organisms that fight the pest is another example of an alternative to pesticide use. These organisms can include natural predators or parasites of the pests. Biological pesticides based on entomopathogenic fungi, bacteria and viruses cause disease in the pest species can also be used (Miller, 2004).

Interfering with insects' reproduction can be accomplished by sterilizing males of the target species and releasing them, so that they mate with females but do not produce offspring (Miller, 2004). This technique was first used on the screwworm fly in 1958 and has since been used with the medfly, the tsetse fly and the gypsy moth (Web Archive, 2007). However, this can be a costly, time consuming approach that only works on some types of insects.

2.11 Statistics about pesticides use

2.11.1 International statistics about pesticides use

Figure (3) shows the increase of the total global pesticide production over the last decades. Production is measured in million tones here.

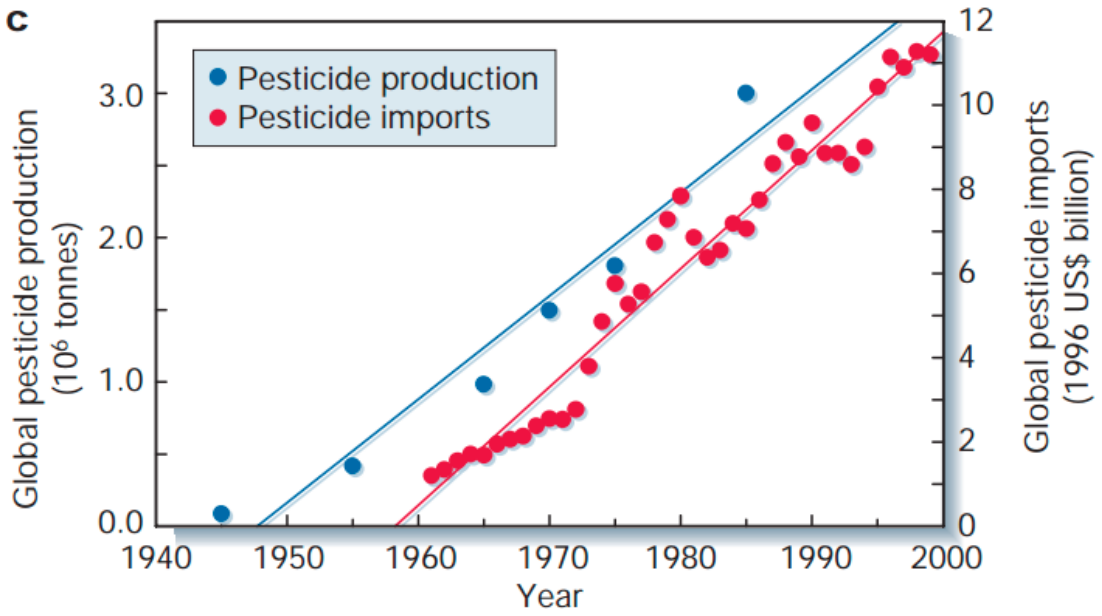

Figure (3): Total global pesticide production and global pesticide imports, 1940s-2000.
Source: (Tilman, Cassman, Matson, Naylor, & Polasky, 2002).

Figure (4) shows pesticide use, broken down by product type in the US (As an example). It is measured in tones of active ingredient. Throughout this entire period herbicides were the most commonly used pesticides.

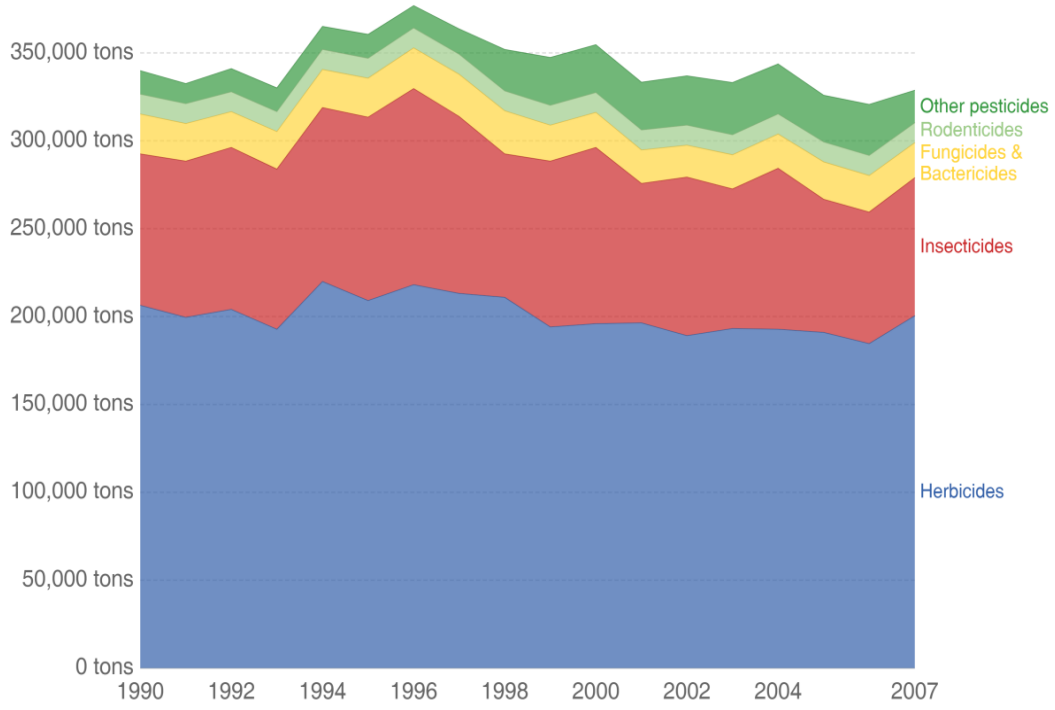

Figure (4): Pesticide production in US by type.
Source: (Roser, 2019)**.**

Also, Figure (5) shows the percentage of the pesticide used worldwide during (1990-2017).

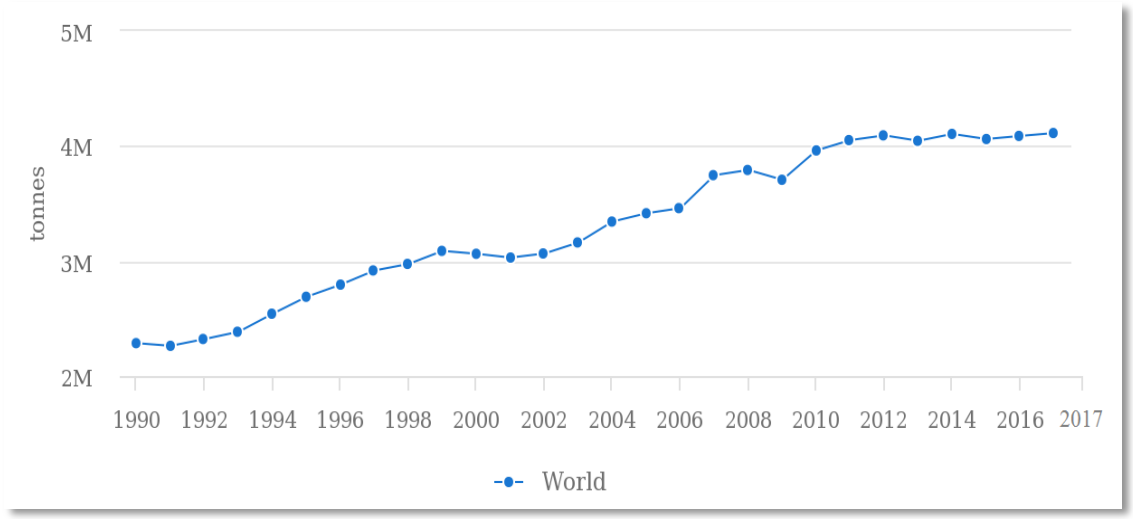

Figure (5): Percentage of pesticide use around the world.

Source: (Food and Agriculture Organization of the United Nations, 2019).

Moreover Figure (6) shows the percentage of the pesticide use by continent, (Average 1990 – 2017).

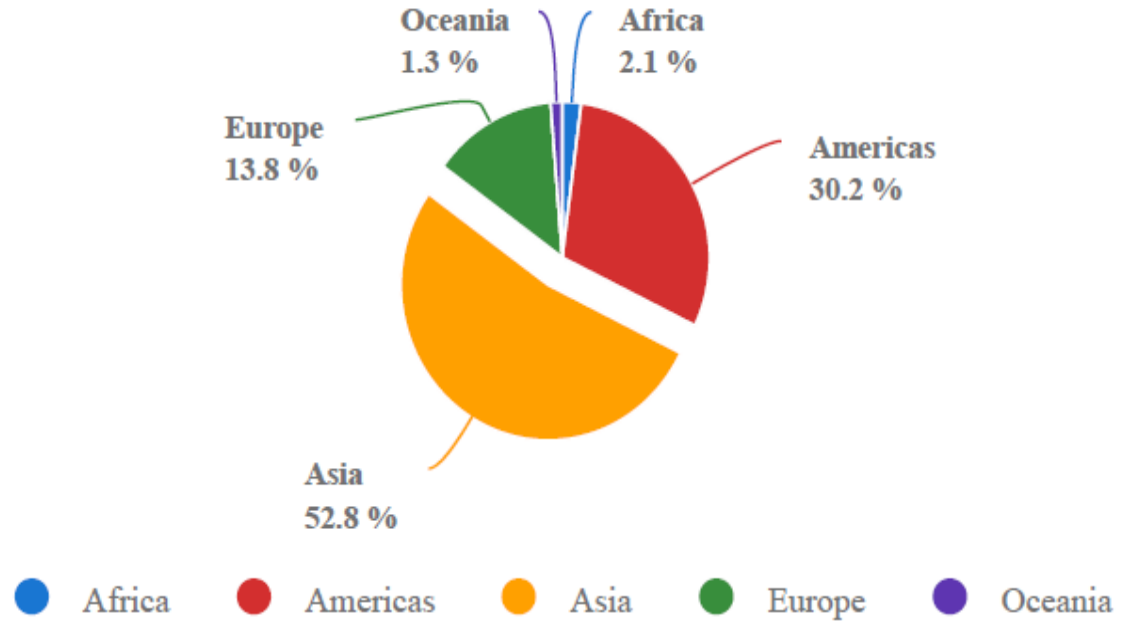

Figure (6): Percentage of pesticide use by continent.

Source: (Food and Agriculture Organization of the United Nations, 2019)**.**

Figure (7) shows the percentage of the pesticide use for top 10 countries, (Average 1990 – 2017).

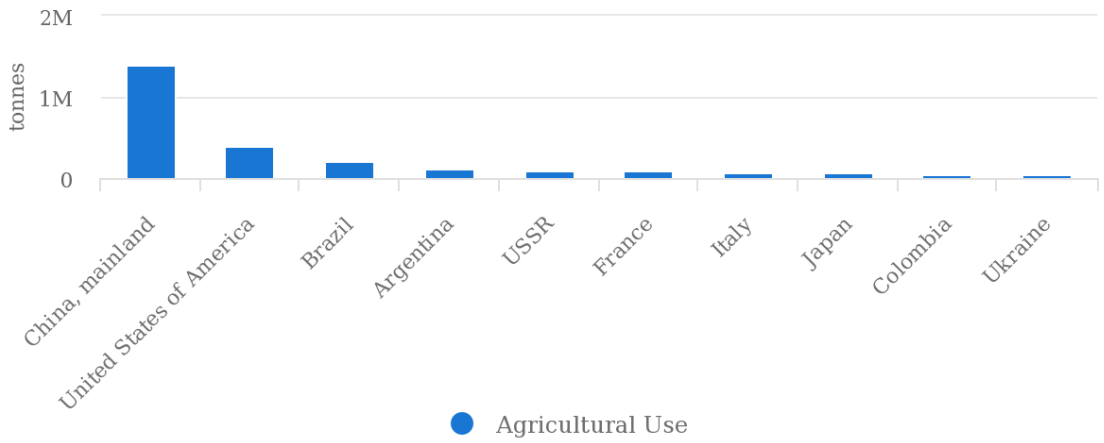

Figure (7): Percentage of pesticide use for top 10 countries.

Source: (Food and Agriculture Organization of the United Nations, 2019)**.**

2.11.2 Arab statistics about pesticides use

Figure (8) shows the total pesticide use of some Arab countries. Total pesticide use measured in tones of pesticide consumption per year.

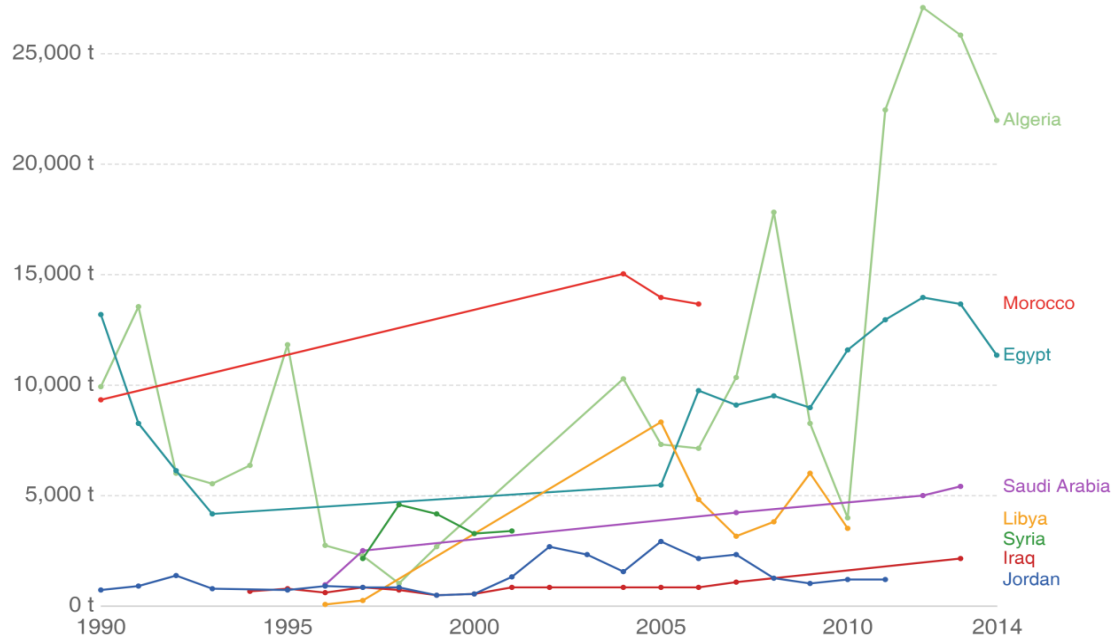

Figure (8): Total pesticide use of some Arab countries.

Source: (Roser, 2019)**.**

Figure (9) shows pesticide use per hectare of cropland of some Arab countries. Average pesticide application per unit of cropland, measured in kilograms per hectare.

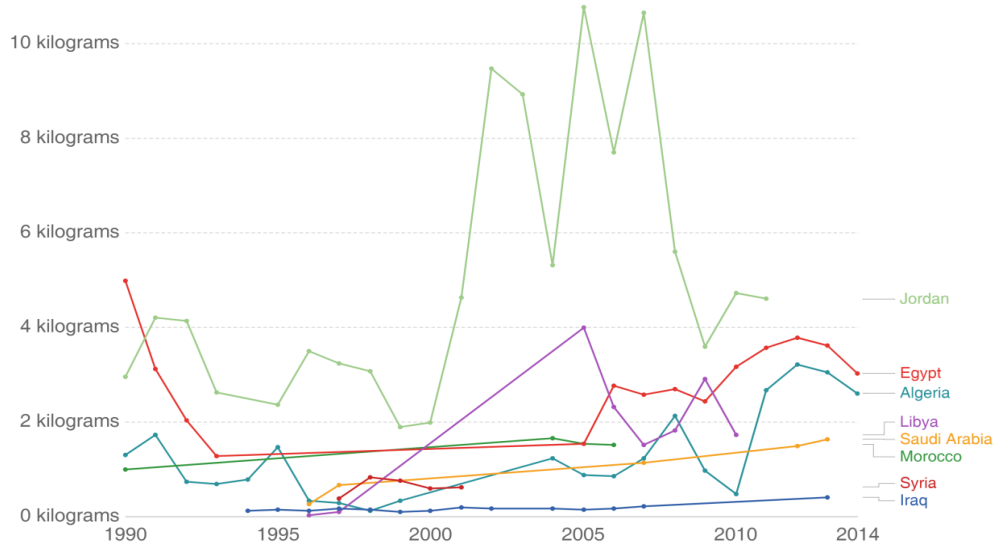

Figure (9): Pesticide use per hectare of cropland of some Arab countries.
Source: (Roser, 2019)**.**

Whereas Figure (10) shows pesticide breakdown by type, Jordan (As an example). Pesticide use, broken down by product type, measured in tones of active ingredient.

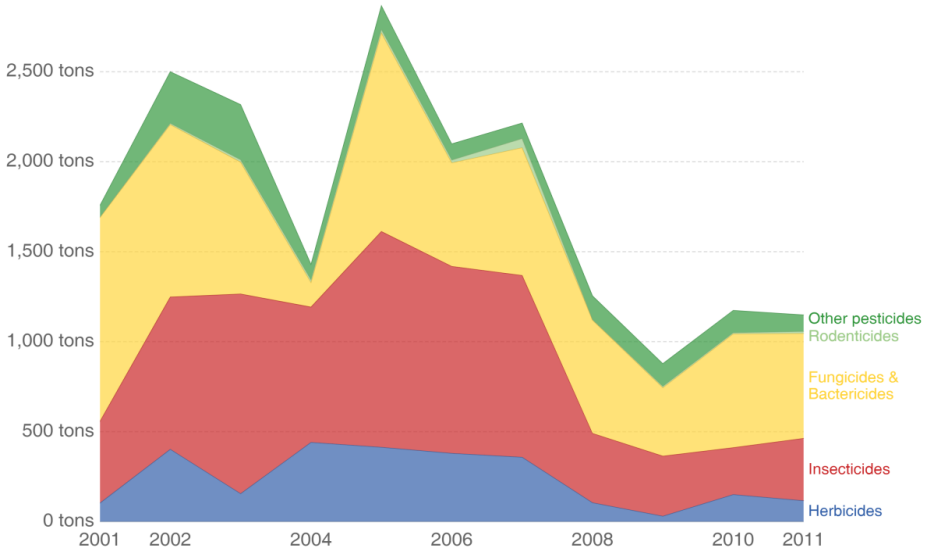

Figure (10): Pesticide breakdown by type in Jordan.
Source: (Roser, 2019)**.**

2.11.3 Palestinian statistics about pesticides use

Figure (11) shows the total pesticide use in Palestine. Total pesticide use measured in tones of pesticide consumption per year.

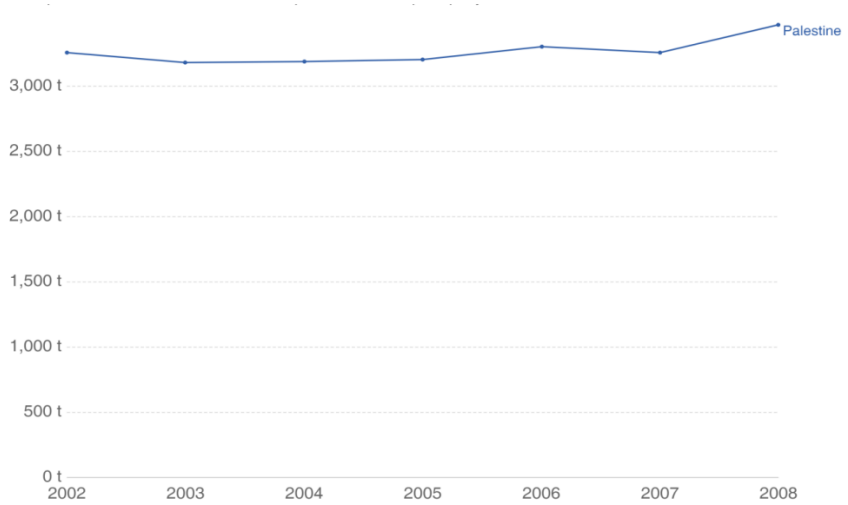

Figure (11): Total pesticide use in Palestine.

Source: (Roser, 2019)**.**

Figure (12) shows the total insecticide use in Palestine. Annual quantity of insecticides used in agriculture, measured as the tones of active ingredient per year.

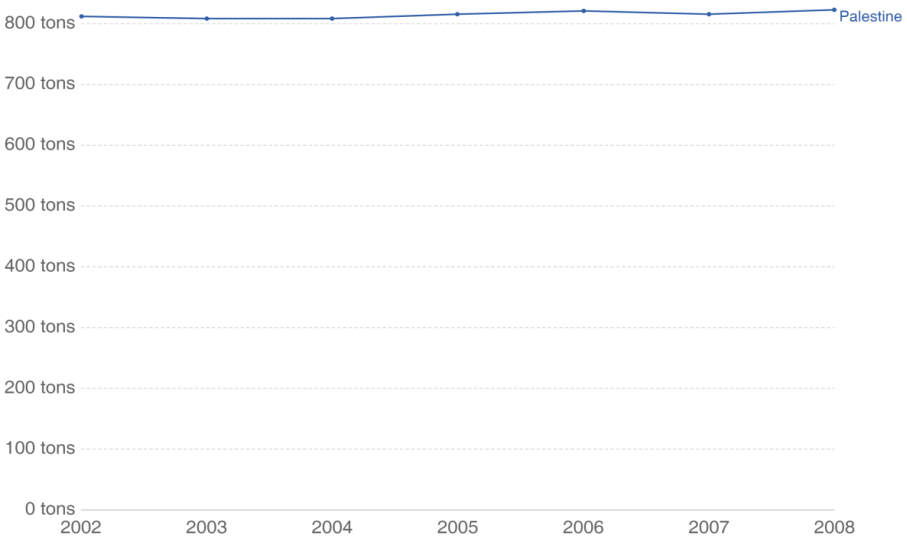

Figure (12): Total insecticide use in Palestine.

Source: (Roser, 2019).

Also, Figure (13): shows the Pesticide use per hectare of cropland in Palestine. Average pesticide application per unit of cropland, measured in kilograms per hectare.

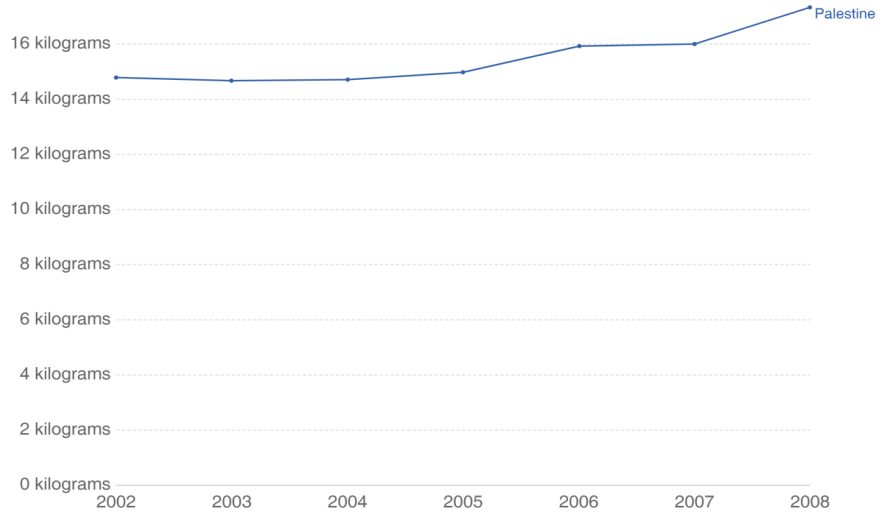

Figure (13): Pesticide use per hectare of cropland in Palestine.

Source: (Roser, 2019)**.**

As well as Figure (14) shows the pesticide breakdown by type in Palestine. Pesticide use, broken down by product type, measured in tones of active ingredient.

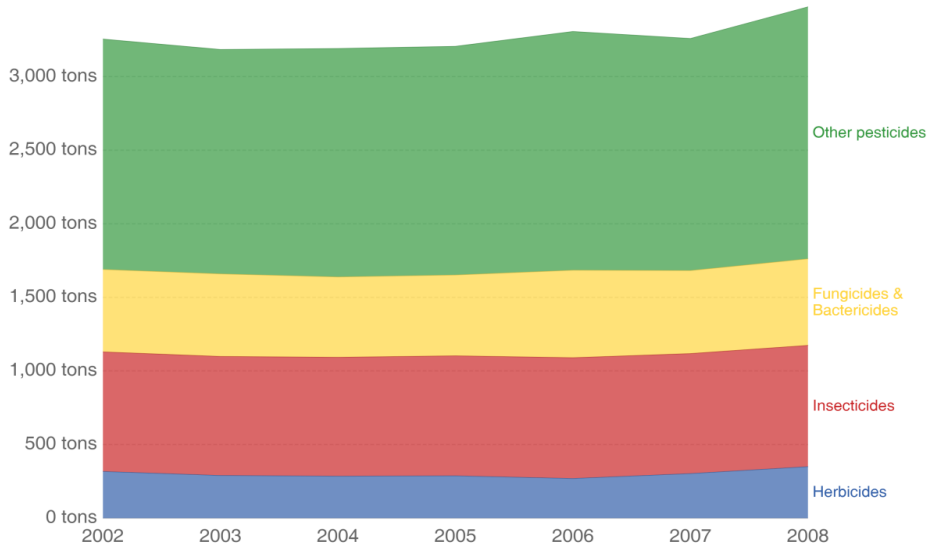

Figure (14): Pesticide breakdown by type in Palestine.

Source: (Roser, 2019).

B. Literature review

Literature shed the light on the subject of knowledge about pesticide and applying safety practices among farmers. It includes reading and reviewing documentation and information from different sources, such as Palestinian ministry of agriculture, annual reports from the different organizations, several interviews were held with experts in the field of agriculture, previous literature, thesis, reports, published papers, etc. Moreover, the researcher depends on primary sources for collecting data, that was written by the original researchers.

These literatures are:

- A Guide to pesticide regulation in California:

This guide contains information on pesticide laws and regulations, DPR's organizational structure, an explanation of regulatory and registration processes, a description of local and state enforcement activities, and details on DPR initiatives to protect people and the environment (California Department of Pesticide Regulation "DPR", 2017).

- A case study of health risk estimates for pesticide-users of fruits and vegetable farmers in Cameroon:

It aimed to assess the health risks of vegetable farmers to pesticide users in Cameroon. The main objective of the study was to investigate the health risk due to pesticide use by small scale independent vegetable farmers and fruits farmers employed under multinational cooperation in Cameroon. The

main types of vegetables and fruits produced in Cameroon, the percentage of farmers using chemical pesticides and the frequency and dosage of pesticides use were also investigated. The types, source of pesticides used and method of application of the available pesticides as compared to the recommended standard methods were equally analyzed. Finally, common illnesses in the area which may be related to the use of pesticides were also analyzed. It pointed out that there is a significant proportion of farmers and workers at risk of health problems resulting from the use of pesticides. Majority of the farmers don't use body covering, eye protection, head covers or nose masks to protect themselves when spraying pesticides. Some farmers even eat, smoke or drink during spraying exposing themselves to hazards. Some farmers use pesticides meant for cocoa, coffee or cotton to spray garden crops and others mix insecticides and fungicides to spray against insects even in the absence of a fungi infection (Amuoh, 2011).

- Misuse of pesticides by vegetable farmers in Palestinian territories and recommendations for their proper use:

It was conducted to study the misuse of pesticides in Nablus, Tulkarm and Jenin districts. The results have revealed that up to 50% of farmers usually do not read the directions on the labels of pesticide containers. Some of them (20-36%) also dispose of the empty pesticide containers by throwing them in fields or leaving them in corners or near the field hedges. They burn empty fiber and paper containers of pesticides including those of herbicide and they may often not keep enough safe distance from the

smoke. Some of the farmers (2-21%) recklessly open containers or pour into the spraying apparatus, as well as spray the pesticides in windy days. Also, 51% of the pesticides available in the Palestinian markets have Hebrew illustration. Furthermore, up to 61% of the farmers ignore the official recommendations of the agricultural extension service. The results showed that most farmers (87-91%) ignore the necessity of wearing the appropriate protective clothing. Furthermore, 80-85% of them do not accurately measure the application rate of pesticides using the proper equipment. Other form of misuse of pesticides is that many farmers (31-41%) expose themselves to the pesticides, sometimes using their mouths to blow out clogged lines and nozzles. Also, 80% of the farmers whose fields are located beside water canals spray herbicides to control the wild vegetation around them. Above all, most farmers (up to 95%) never precisely observe the safety periods specified between the applications of the pesticides and the harvesting period or reentry time (Sawalha, 2012).

- Health risk among pesticide sellers in Bamenda (Cameroon) and peripheral Areas:

This study aimed to evaluate the health risk among pesticide sellers as a resulting due to exposure to pesticide Thirty-two questionnaires were administered to 32 pesticide sellers systematically selected, and chi square was used for statistical analysis. From each shop, a respondent was chosen among the workers according to its daily time spent in the workplace. The results showed that there is similarity between sellers in Bamenda and

peripheral area; one active ingredient (metalaxyl) and one formulation (beauchamp) sold are not registered; throat irritation, headaches, fatigue, skin irritation, eye irritation, and difficulty in breathing with more cases of nose irritation were symptoms observed; pesticides are stored either in the shops or in warehouses; safety measures generally applied are sitting outside the shop, taking medicated charcoal and the use of protective clothing; 56% have experience less than 5 years. Permanent pesticide sellers are then exposed to chronic intoxication in Bamenda and neighboring zones (Sonchieu, Akono, Ngwamitang, & Ngassoum, 2018).

- Assessing knowledge of perceived health risk posed by agricultural pesticides among farmers in Ikenne local government area Ogun state Nigeria:

The purpose of this study is to assess level of farmers' awareness about the health risks associated with pesticide use and misuse. The result showed that preventive measures by farmers, including wearing of protective gears while applying pesticides to farmland was common place. It was also found that pesticide disposal practice was poor among farmers, however, farmers practice hand washing, change of clothes and showering after application. Health risk perception was found to be moderate and it was suggested that the reason for the lack of preventive practices and use of protective gear was as a result of low perceived seriousness of the health hazard posed by pesticides. It is hence recommended that farmers should be trained on health hazard of pesticide use and supply of protective gears should be made available at subsidized rate (Gibson, et al., 2017).

- Agricultural pesticides and its effects upon health In Gaza governorates:

The study dealt with agricultural pesticides and their impact on health in the Gaza governorates. It highlighted on the reality of the pesticides, their quantities and types during the year 2014 and compared to previous years, as well as clarified the sources of pollution of the environment with pesticides, and the reasons for their deployment by identifying farms for reasons of deployment where the researcher distributing (501) the identification of the composed of farmers from several areas in which spotted the problems and consequences of the excessive use of agricultural pesticides and its dangers on the farm's health and the health of citizens and the statement of the effect of some of the pesticides used in the provinces of Gaza, as the study on the impact of hormones plant, as well as the impact of pesticides on the environment of soil, water and air and the enemies of vitality and Wildlife and its impact on the food, and also study examined pesticide residues in breast milk and blood plasma arose researcher to monitor pesticide residues them, as well as agricultural products (exported and imported and domestic) (Alatawna, 2014).

- Farmers' knowledge, practices and injuries associated with pesticide exposure in rural farming villages in Tanzania:

The objective of this study was to describe the exposure of farmers to pesticides, knowledge about pesticide risks, the experience of previous poisoning, and hazardous practices that may lead to acute poisoning.

Insecure practices for pesticide handling was assessed through pesticide storage monitoring, PPE conditions and through self-reports for pesticide disposal and calibration equipment. The study found a high potential for exposure to pesticides in the selected community in Tanzania's rural areas, a high percentage of acute self-reported pesticide poisoning and poor registration in hospital records (Lekei, Ngowi, & London, 2014).

- Farmer’s knowledge, attitudes and practices, and their exposure to pesticide residues after application on the vegetable and fruit crops in North of Delta, Egypt:

The aim of this study is to assess farmers' awareness of the safe use of pesticides and field spraying practices that may potentially expose them to chemical hazards. The study was carried out among smallholder farmers of intensive vegetable and fruit production zones at northern delta, Egypt. Data was based on a random sample of 86 farmers using structured interviews and direct field observations. The obtained results showed that in spite of the farmers have good knowledge about the potential negative effects of pesticides on the human and for somewhat on the environment, lack of their following safety measures was dominant (Abbassy, 2017).

- Pesticide Knowledge and Safety Practices among Farm Workers in Kuwait: Results of a Survey:

The aim of this study was to assess the levels of knowledge, attitude and practices of Kuwaiti farmers regarding the safe use of pesticides. A total of

250 farmers participated in this study through in-depth interviews and observations on-farm. The majority of the farmers acknowledged that pesticides were harmful to their health (71%) and the environment (65%). However, farmers' level of knowledge of pesticide safety is insufficient. Over 70% of the farmers did not read or follow pesticide label instructions, and 58% did not use any personal protective equipment (PPE) when handling pesticides (Jallow, Awadh , Albaho, Devi, & Thomas, 2017).

Chapter Three

Methodology

3.1 Research design

This research is followed a descriptive, non-experimental research design.

Whereas a descriptive research aims to accurately and systematically describe a population, situation or phenomenon. It can answer what, when, where, and how questions, but not why questions. To determine cause and effect, experimental research is required. A descriptive research design can use a wide variety of quantitative and qualitative methods to investigate one or more variables. Unlike in experimental research, the researcher does not control or manipulate any of the variables, but only observes and measures them (McCombes, 2019).

3.2 Inclusion & Exclusion criteria

3.2.1 Inclusion criteria

- All farmers, who are living in Tulkarm governorate, and available at the study period.
- Small or big size farm owner.
- The farmers who were interviewed during the pilot study.

3.2.2 Exclusion criteria

- ❖ Farmers who are none available at the time of data collection.
- ❖ Farmers who refuse participation.

3.3 Study population

The target population of this study is all farmers in Tulkarm governorate. The total number of farmers in Tulkarm governorate was 3900 according to the Palestinian Ministry of Agriculture.

3.4 Study period

The study was performed from March 2019 to March 2020.

3.5 Sampling technique and sample size

The sample size was 350 farmers from Tulkarm governorate. The number of samples was measured by Sample Size Calculator *(see annex 8)*. Which helps to determine the ideal sample size.

Sampling was simple random method; in which each individual was chosen randomly and entirely by chance, such that each individual had the same probability of being chosen at any stage during the sampling process.

3.6 Study tool

A questionnaire was distributed to farmers who illegible to the study criteria. The questionnaire included questions about (level of knowledge in

pesticide, applied safety practices when dealing with pesticide, practices regarding, handling, disposal and storage of pesticides, and the obstacles faced by farmers) *(see annex 9)*.

3.7 Response rate

The number of respondents was 350 (represents 100%).

3.8 Construction of questionnaire

A questionnaire was designed to assess the levels of knowledge of the safe use of pesticides and safety practices applied by farmers in Tulkarem governorate. It was reviewed and validated by the supervisors, designed in English and translated into Arabic, the national language understood by farmers. The questionnaire included closed and open-ended questions and was pre-tested by randomly interviewing 135 farmers included in this study. The closed questions were in a multiple-choice format. Farmers had to select only the appropriate answer or answers that they thought will describe their opinion on a particular issue.

The questionnaire contained eight main sections. Each section was designed to collect information on a particular issue related to the safe use of pesticides as the following:

- The 1st part included items related to the social characteristics of the farmer.
- The 2nd part included items related to the characteristics of agricultural land.

- The 3rd part included items related to farmer knowledge of pesticide use.
- The 4th part included items related to farmers knowledge of health and safety measures during the use of pesticides.
- The 5th part included items related to the health effects of pesticide use.
- The 6th part included items related to the storage of pesticides.
- The 7th part included items related to the environmental effects of pesticide use.
- The 8th part included items related to obstacles and suggestions.

3.9 Validity of questionnaire

3.9.1 Face validity

It is designed to make people more responsive to the questionnaire; the researcher checked the face validity twice. The first check was through 8 expert persons from An-Najah National University and the Ministry of Agriculture who gave their suggestions and judgment about the questionnaire's adequacy. The second check was during the pilot study, as the included participants were asked about the structure of the questions, its shape, and typo-free.

3.9.2 Content validity

It was done before data collection. The questionnaire was sent to 7 experts (annex 10) with a covering letter and the instructions about the study, overall aim, objective, field of the study, and other relevant information. The experts were asked to evaluate and revise the questionnaire's relevance to the study, clarity, and completeness of each section. Feedback was obtained from experts, and modification was done with the researcher supervisors, where their opinions were considered. The questionnaire was translated to Arabic by the researcher and assessed by an Arabic language expert who gave advice and modifications.

3.10 Pre-test of the questionnaire

A Pre-study was conducted on 10% of the sample. 35 participants were included as a pilot study group to ensure the questions are clear and avoid questions length & ambiguity. The pilot study group included farmers form different age groups, gender, educational levels, and residency status. All of them were provided with a clear explanation about the study and its objectives before application, to ask them about difficulties and their opinion of the questionnaire. The results of the pilot study were very helpful in modifying the tools.

3.11 Reliability of questionnaire

The Reliability of an instrument is the degree of consistency with which it measures the attribute it is supposed to measure. The reliability of an

instrument was done by computing Cronbach's Alpha coefficient. Whereas Cronbach's alpha is the most common measure of reliability (for most purposes, reliability coefficient above 0.7 is considered satisfactory); it was done using SPSS program. The results ranged from 0.822 and 0.910 and the general reliability for all items is equal to 0.855. This range is considered very well, and indicated high reliability of the questionnaire.

3.12 Data collection

Data was collected by the researcher through face-to-face farmers' interview. The interview was started by giving the farmers complete instructions and explanations about the study and its objectives and the importance of providing reliable answers. The interview was done at an appropriate time, taking all ethical considerations.

3.13 Data entry and analysis

Excel software program was used for data entry.

The data were analyzed using the Statistical Package for Social Sciences (SPSS) programs, with the assistance of a statistician.

Frequency tables for the study variable were conducted.

3.14 Ethical consideration

Approval letters were taken from An-Najah National University, and the Palestinian Ministry of Agriculture; as well as consent was taken from each participated farmer.

An explanatory letter was attached to the questionnaire and provided to the participants, which include the study title, objectives and other information needed to make clarification to the participants.

The researcher gave the participants the right to participate or not, and ensure confidentiality (anonymity was maintained into the explanatory letter).

Respect all personal beliefs. Moreover, choose the right place to collect information according to farmers' convenience.

3.15 Limitation of the study

The researcher faced some challenges during the time course of data collection and questionnaire preparation, which illustrated as;

- Lack of information, insufficient and inappropriate data registry.
- Lack of previous studies in the research area.
- Time limitations.
- Lack of financial funding for the study.

The prevailing political situation in the area which limited movements and makes difficulties in research studies due to barriers and check-points. And, difficulty of transportation.

Chapter Four

Results and discussions

This chapter points out the results and discussion of the study, including descriptive analysis that presents the socio-demographic data of the study and the answers to the questions of the study. The researcher used representative samples of 350 farmers from the study area.

The response rate was 100%. The researcher used proper statistical software, including frequencies and percentage. Appropriate statistical tests such as Chi-Square test were used. Characteristics of study participants are demonstrated below:

A. Descriptive part

Analysis of the study questions

A.4.1. Personal characteristics of the farmers

The results revealed that the gender distribution of the participants reflects higher males prevalence than females. Figure (15) showed the distribution of study participants by gender; it is shown that 71 participants were female, which represents 21% of total participants, and 279 participants were males and represent 79%.

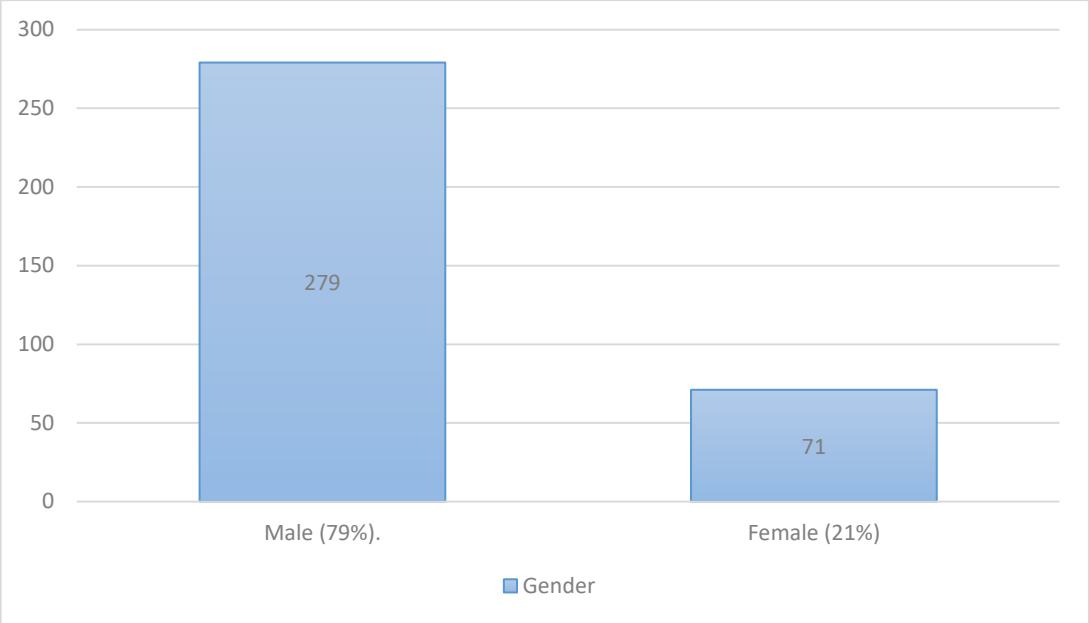

Figure (15): Distribution of study participants by gender.

While Figure (16) described the distribution of study participants by age group; it shows that 25 participants were less than 20 years old, which represents 7.1% of total participants; 64 participants (18.3%) their age group was from (21-30) years; 107 participants (30.6%) their age group was from (31-40) years; 125 participants (35.7%) their age group was from (41-60) years, and 29 participants (8.3%) were more than 61 years.

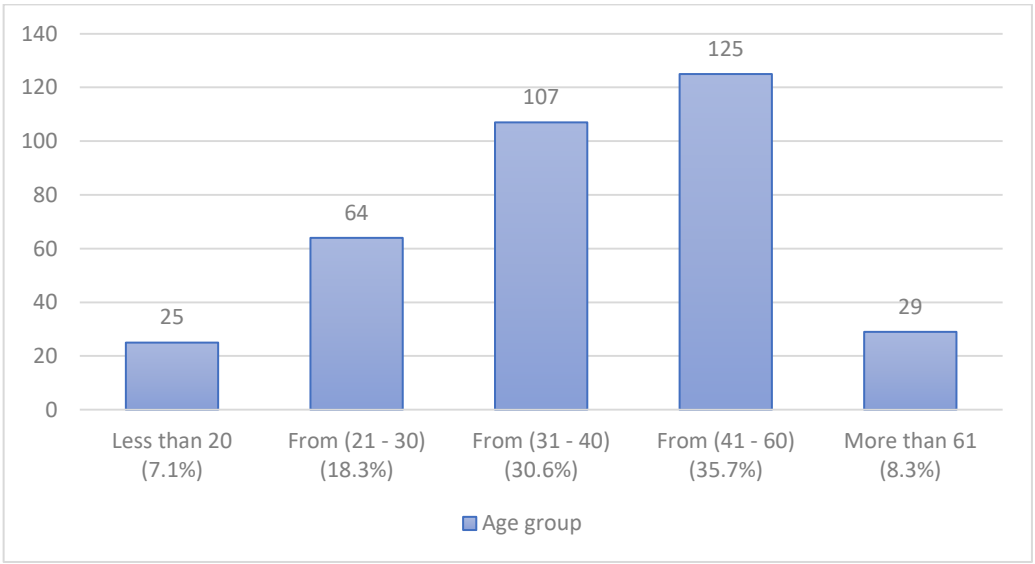

Figure (16): Distribution of study participants by age group.

Also, Figure (17) describes the distribution of study participants by marital status; it shows that 104 participants were single which represents 29.71% of total participants; 221 participants (63.14%) were married; 14 participants (4%) are divorced, and 11 participants (3.14%) were widow/widower.

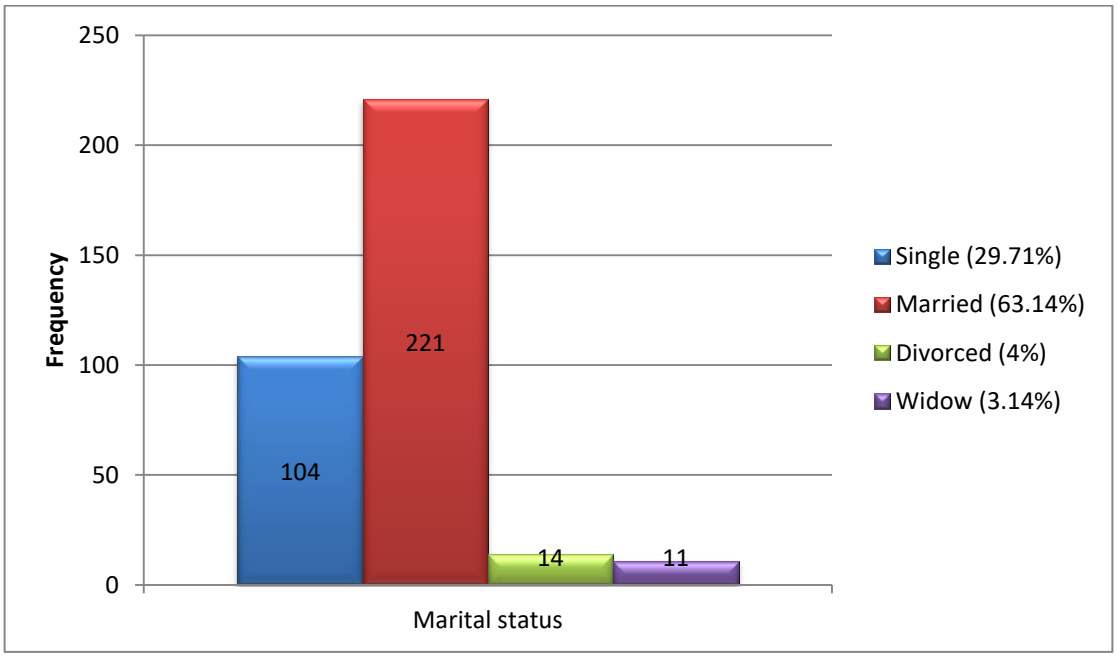

Figure (17): Distribution of study participants by marital status.

Figure (18) described the distribution of study participants by their educational level. It showed that 72 participants their educational level was less than high school, representing 20.6% of total participants. While 95 participants (27.1%) their educational level was high school; 69 participants (19.7%) their educational level was diploma; 94 participants (26.9%) their educational level was a bachelor; 18 participants (5.1%) their educational level was master, and 2 participants (0.6%) their educational level was doctorate.

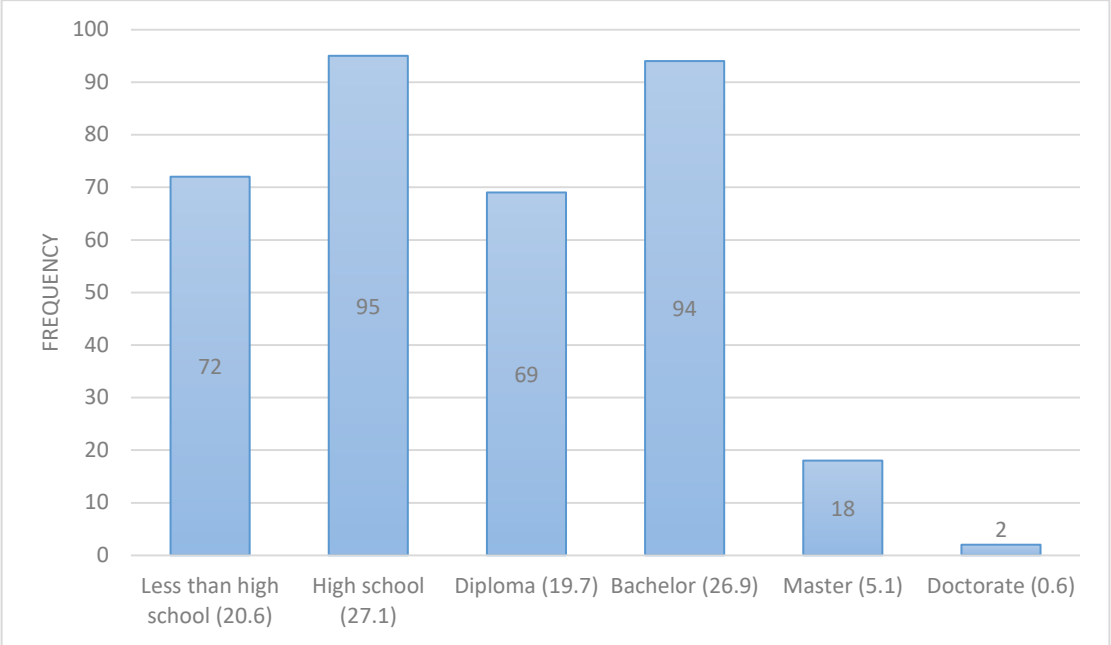

Figure (18): Distribution of study participants by educational level.

The distribution of study participants by current work, was analyzed to determine if the farmer is a full-time farm worker or has another job. Table (1) showed that 256 participants worked only in agriculture, representing 73.1% of total participants. While 69 participants (19.7%) were employees in the government, private sector or civil or international organizations. Besides 46 participants (13.1%) were working inside the green line; 85 participants (24.3%) were working in the free business; 18 participants (5.1%) were retired; 41 participants (11.7%) were house wives; finally, 49 participants (14%) were students.

Table (1): Distribution of study participants by current work

Item		Frequency	Percentage
Current work (a full-time farm worker or having another job)			
Full time for agricultural work only:	Yes	256	73.1
	No	94	26.9
	Total	350	100
Employee (government, private sector or civil or international organizations):	Yes	69	19.7
	No	281	80.3
	Total	350	100
Work inside the green line:	Yes	46	13.1
	No	304	86.9
	Total	350	100
Free business:	Yes	85	24.3
	No	265	75.7
	Total	350	100
Retired:	Yes	18	5.1
	No	332	94.9
	Total	350	100
House wife:	Yes	41	11.7
	No	309	88.3
	Total	350	100
Student:	Yes	49	14
	No	301	86
	Total	350	100

Table (2) described the distribution of study participants by the number of family members. The number of family members ranged between (2 to 17) members. Moreover, it describes the distribution of study participants by the number of workers in agriculture, whether male or female. All characteristics of the number of family members are demonstrated in this table.

Table (2): Distribution of study participants by family members

Item		Frequency	Percentage
Number of family members.	2	17	4.86
	3	22	6.29
	4	31	8.86
	5	65	18.57
	6	64	18.29
	7	66	18.86
	8	51	14.57
	9	12	3.43
	10	15	4.29
	11	4	1.14
	12	1	0.29
	13	1	0.29
	17	1	0.29
	Total	350	100
Number of workers in agriculture: (males).	0	50	14.29
	1	93	26.57
	2	119	34
	3	62	17.71
	4	15	4.29
	5	7	2
	6	1	0.29
	8	1	0.29
	9	1	0.29
	11	1	0.29
	Total	350	100
Number of workers in agriculture: (females).	0	229	65.4
	1	87	24.9
	2	24	6.9
	3	5	1.4
	4	4	1.1
	7	1	0.3
	Total	350	100

A.4.2 Distribution of study participants by agricultural land characteristics

When characterizing the study participants by agricultural land ownership; Figure (19) showed that 257 participants owned agricultural land,

representing (73.43%) of the total sample; 60 participants (17.14%) rented the agricultural land; 28 participants (8%) guaranteed the agriculture land, and 5 participants (1.43%) are quotas the agricultural land.

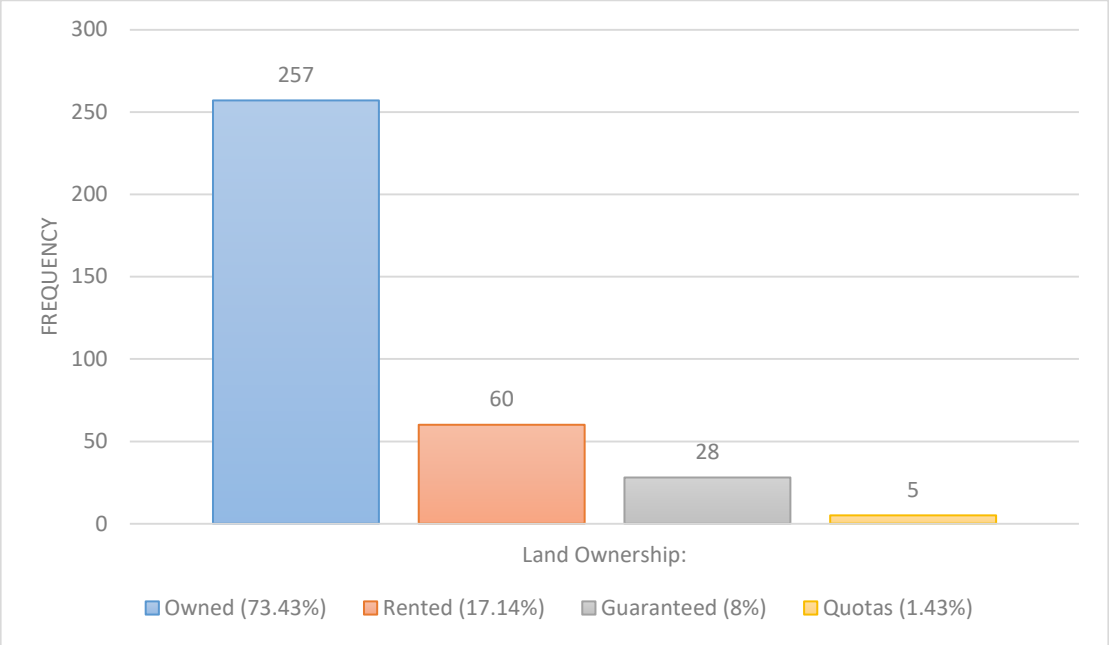

Figure (19): Distribution of study participants by land ownership.

The distribution of study participants by the total area of agricultural land is studied. It shows differences in the area of agricultural land among the participants. As the largest area was 14 donums, and the smallest area was 40 m^2. Details of agricultural areas are shown in table (3).

Table (3): Distribution of study participants by total area of agricultural land

Item		Frequency	Percent
Total area of agricultural land:	1 Donum	20	5.71
	1.5 Donums	28	8
	10 Donums	29	8.29
	100 meters	1	0.29
	112 Meters	1	0.29
	12 Donums	10	2.86
	14 Donums	1	0.29
	2 Donums	1	0.29
	2 Donums	52	14.86
	2.5 Donums	4	1.14
	3 Donums	43	12.29
	3.5 Donums	1	0.29
	300 Meters	1	0.29
	4 Donums	1	0.29
	4 Donums	33	9.43
	40 Meters	1	0.29
	400 Meters	1	0.29
	5 Donums	54	15.43
	50 Meters	1	0.29
	6 Donums	26	7.43
	600 Meters	1	0.29
	7 Donums	16	4.57
	700 Meters	1	0.29
	8 Donums	22	6.29
	9 Donums	1	0.29
	Total	350	100

Table (4) described the distribution of study participants by the area of agricultural land currently used. It showed differences in the area of agricultural land "currently used" among the participants. As the largest area "currently used" was 14 donums, and the smallest was 40 meters. Also, all details about the agricultural areas "currently used" are described in table (4).

Table (4): Distribution of study participants by the area of agricultural land currently used

Item		Frequency	Percent
The area of agricultural land currently used by farmers:	1 Donum	31	8.86
	1.5 Donum	28	8
	10 Donum	25	7.14
	100 meters	1	0.29
	112 Meters	1	0.29
	12 Donum	6	1.71
	14 Donum	1	0.29
	2 Donum	62	17.71
	2.5 Donum	5	1.43
	200 Meters	1	0.29
	3 Donum	41	11.71
	3.5 Donum	1	0.29
	300 Meters	2	0.57
	4 Donum	30	8.57
	40 Meters	1	0.29
	4Donum	1	0.29
	5 Donum	1	0.29
	5 Donum	45	12.86
	50 Meters	3	0.86
	500 Meters	1	0.29
	6 Donum	23	6.57
	7 Donum	13	3.71
	700 Meters	2	0.57
	8 Donum	22	6.29
	800 Meters	2	0.57
	9 Donum	1	0.29
	Total	350	100

Table (5) showed the distribution of study participants by studied area locations. 94 participants were living in Al Sha'rawiya, representing (26.86%) of the total sample; 80 participants (22.86%) were living in Al-Kafriyat; 93 participants (26.57%) were living in Wadi Alshaeir, and 83 participants (23.71%) were living in Tulkarem city and its suburbs. Among the participants, 194 participants are applying non-protective agricultural

patterns (open field) representing (55.4%) of the total sample. While 41 participants (11.7%) are applying protected agriculture system (greenhouses); and 115 participants (32.9%) their agricultural land was mixed of open field and greenhouses. Also, it showed the number of workers in the agricultural land, and it ranged from (1 to 15) workers.

Table (5): Distribution of study participants by studied area locations

Locations		Frequency	Percent
Living area:	Al Sha'rawiya	94	26.86
	Al-Kafriyat	80	22.86
	Wadi Alshaeir	93	26.57
	Tulkarem city and its suburbs.	83	23.71
	Total	350	100
Agriculture land:	Open	194	55.4
	Greenhouses	41	11.7
	Open and Greenhouses	115	32.9
	Total	350	100
Number of workers in the agricultural land:	1	66	18.86
	2	108	30.86
	3	72	20.57
	4	65	18.57
	5	24	6.86
	6	6	1.71
	7	2	0.57
	8	2	0.57
	9	1	0.29
	10	2	0.57
	12	1	0.29
	15	1	0.29
	Total	350	100
Is the agricultural labor force on the farm trained, qualified, and have sufficient experience to work on the farm?	Yes	210	60
	No	140	40
	Total	350	100

The study findings revealed that the dominant cultivated plant species were tomatoes. In contrast, the least cultivated species were apple, Cantaloupe, Carob, Garlic, Lentil, Mango, Nut, Pomegranate, Rocca, and Watermelon (see Table 6).

Table (6): Distribution of study participants by the types of crops they grow in their lands

Item	Frequency (Number of farmers)	Percent
Tomato	127	36.29
Cucumber	117	33.43
Olive	110	31.43
Various vegetables	56	16
Cauliflower	55	15.71
Beans	42	12
Pepper	40	11.43
Almonds	34	9.71
Zucchini	32	9.14
Citrus	30	8.57
Corchorus olitorius	29	8.29
Aubergine	28	8
Guava	26	7.43
Thyme	26	7.43
Peas	19	5.43
Lemon	17	4.86
Okra	16	4.57
Potato	16	4.57
Beans	15	4.29
Onions	14	4
Cabbage	13	3.71
Wheat	13	3.71
Avocado	13	3.43
Grape	10	2.86
Parsley	10	2.86
Louse	9	2.57
Fruitful trees	8	2.29
Lettuce	8	2.29
Orange	8	2.29
Barley	7	2
Figs	6	1.71

Item	Frequency (Number of farmers)	Percent
Sage	6	1.71
Cherries	5	1.43
Chickpeas	5	1.43
Radish	5	1.43
Spinach	5	1.43
Capsicum	4	1.14
Corn	3	0.86
Fruits	3	0.86
Legumes	3	0.86
Blueberry	2	0.57
Cereal	2	0.57
Mint	2	0.57
Peaches	2	0.57
An apple	1	0.29
Cantaloupe	1	0.29
Carob	1	0.29
Garlic	1	0.29
Lentil	1	0.29
Mango	1	0.29
Nut	1	0.29
Pomegranate	1	0.29
Rocca	1	0.29
Watermelon	1	0.29

The study results revealed that the farmers' majority (71%) in the studied area are facing agricultural related problems table (7). The highest area that had agricultural problems were Al Sha'rawiya and Wadi Alshaeir, while the lowest were the Al-Kafriyat. These problems are diverse and found all over the value chain, some are caused by crop diseases and pests, poor marketing, high input and production costs. In addition to climate change-related problems; for instance, the rain precipitation delaying and distribution, and deterioration of soil fertility. On the other hand, 101 participants (28.9%) claimed that they did not face any agricultural problems.

Table (7): Distribution of study participants by agricultural problems

Item		Frequency	Percent
Are you facing agricultural problems?	Yes	249	71.1
	No	101	28.9
	Total	350	100
Area of agricultural problems	Al Sha'rawiya	70	20
	Al-Kafriyat	54	15.4
	Wadi Alshaeir	69	19.7
	Tulkarem city and its suburbs.	56	16
	The answer is no.	101	28.9
	Total	350	100
If yes, what are the problems?			
Various crops diseases.		133	38
Poor marketing.		48	13.71
The spread of agricultural pests.		19	5.43
Lack of labor.		16	4.57
High costs of purchasing supplies and low selling prices of the product.		15	4.29
Little or no water.		13	3.71
Weather conditions.		8	2.29
The spread of pigs.		7	2
Lack of agricultural expertise.		7	2
High prices of pesticides.		4	1.14
The use of pesticides does not give a result.		3	0.86
Agricultural area is small.		3	0.86
Fluctuation or lack of production.		4	1.14
Spread of the mole.		2	0.57
Absence of agricultural extension campaigns.		2	0.57
Weeds growth among crops.		2	0.57
The price of seedlings is high.		1	0.29
Difficulty in providing the tools necessary for agriculture.		1	0.29
Lack of tools for agriculture.		1	0.29
Difficulty in providing fertilizers.		1	0.29
The growth of a large number of agar oak between the olive trees.		1	0.29
Agricultural institutions are not interested in agricultural matters.		1	0.29
The workers are not specialized in agriculture.		1	0.29
The absence of financial support.		1	0.29
Lack of rain.		1	0.29
Decreased soil fertility.		1	0.29

Regarding agricultural extension services, Table (8) showed the distribution of study participants by agricultural extension services they received. It indicated that the majority of participants had agricultural extension services office in their area (n=224, represent (64%) from total participants). The highest area that had agricultural extension services office were Wadi Alshaeir, while the lowest were the Al-Kafriyat. Moreover, 174 participants reported that the agricultural extension services were available through the government; 113 participants mentioned that the agricultural extension services were available through the non-governmental institutions; 110 participants mentioned that the agricultural extension services were available through the private sector or companies. While 3 participants stated that the agricultural extension services were available through the personal experience; and 1 participant said that the agricultural extension services were available through the agricultural supplies stores. In addition, 126 participants (36%) did not have agricultural extension services office in their area.

Table (8): Distribution of study participants by agricultural extension services in the studied area

Item		Frequency	Percent
Is there an agricultural extension services office in your area?	Yes	224	64
	No	126	36
	Total	350	100
If yes:			
Area of agricultural extension services:	Al Sha'rawiya	48	13.7
	Al-Kafriyat	43	12.3
	Wadi Alshaeir	71	20.3
	Tulkarem city and its suburbs.	62	17.7
	The answer is no.	126	36
	Total	350	100
Is agricultural extension available through the government?	Yes	174	49.7
	No	50	14.3
	The answer is no.	126	36
	Total	350	100
Is agricultural extension available through civil institutions?	Yes	113	32.3
	No	111	31.7
	The answer is no.	126	36
	Total	350	100
Is agricultural extension available through a private sector or companies?	Yes	110	31.4
	No	114	32.6
	The answer is no.	126	36
	Total	350	100
From other sources, specify:	Personal experience.	3	0.86
	Shops of agricultural tools.	1	0.29

Figure (20) described the distribution of study participants according to Agri-proficiently personnel's availability to supervise the farm. It shows that 254 participants did not have an agricultural engineer or agricultural technician to run their farm, representing 72.6% of the total sample. In comparison, 96 participants (27.4%) have an agricultural engineer or agricultural technician to supervise their farm.

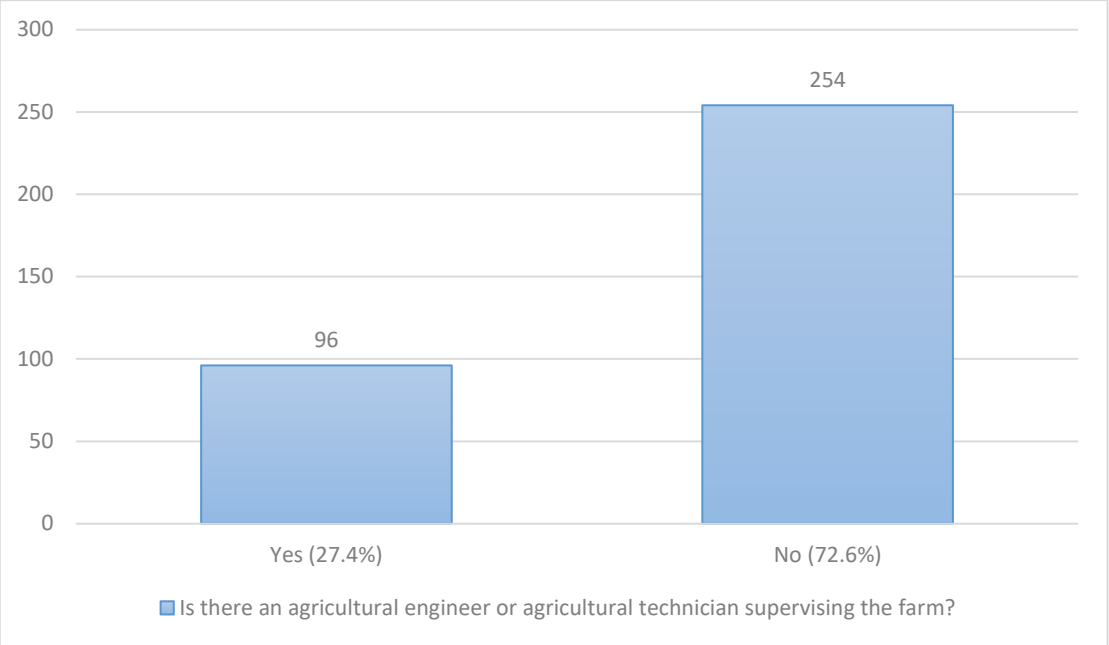

Figure (20): Distribution of study participants by Agri-proficienal personnel's the farm.

A.4.3. Distribution of study participants by their knowledge about the principles of pesticide use

Table (9) showed that the majority of participants (n=336, which represent 96% of the total studied sample) were using pesticides in their agricultural land, while 14 participants (4%) did not use the pesticides at all.

Regarding the type of used pesticides used, the study findings revealed that the highly used type of these pesticides was Imidacloprid (Confidor®, Bayer). The other used pesticides were listed below in table (9).

Table (9): Distribution of study participants by use pesticides in agricultural land

Item		Frequency	Percent
Do you use pesticides in agricultural land?	Yes	336	96
	No	14	4
	Total	350	100
If yes, mention the names of these pesticides:			
Imidacloprid (Confidor®, Bayer).		108	30.86
Dimethoate (Rogor®, Cheminova).		73	20.86
Chlorpyrifos (Dorsban®, Dow Agrosciences).		70	20
Triadimenol (Bayfidan®, Lied chemical).		68	19.43
Difenoconazole (Score®, Syngenta).		43	12.29
Glyphosate Isopropy Amine Salt (Taifun®, Tabozal).		41	11.71
Lambda Cyhalothrin (kung fu®, Syngenta).		34	9.71
Lufenuron (Match®, Syngenta).		31	8.86
Various herbicides.		31	8.86
Various insecticides.		22	6.29
Various pesticides as needed.		22	6.29
Various fungicides.		16	4.57
Bromopropylate (Neron®, Miron).		11	3.14
Glyphosate isopropy amine salt (Roundup®, Monsanto).		8	2.29
Oxyfluorfen (Goal®, Dow Agrosciense).		7	2
Farmer does not know the name.		7	2
Triadimenol (Bayfidan®, Lied chemical).		6	1.71
Dinotefuran (Ipon®, Mitsui chemicals inc).		5	1.43
Mineral Oil (Citrole®, Total Solvents).		5	1.43
Abamectin (Vertimec®, Syngenta).		5	1.43
Diquat (Reglone®, Syngenta).		5	1.43
Penconazole (Ofir 2000®, Syngenta).		4	1.14
Novaluron (Rimon®, Makhteshim chemical works Ltd.)..		3	0.86
Copper hydroxide (Kocide®, DUPONT).		3	0.86
Imidacloprid (Kohinor®, Lied Chemical).		3	0.86
Propanocarp HCL (Dynone®, Bayer).		3	0.86
2,4-D (Albur super®, Makhteshim).		2	0.57
Deltamethrin (Decis®, Bayer crop seince).		2	0.57
Pyraclostrobin + Boscalid (Signum®, BASF).		2	0.57
Various acaricides.		2	0.57
Dimethomorph + Mancozeb (Acrobat®, BASF).		2	0.57
Mancozeb (Manzidan®, DOW AGROSCIENCES).		2	0.57
Mefenoxam + Mancozeb (Ridomil®, Syngenta).		2	0.57
Cypermethrin (Siperin®, Rimi Chemicals ltd).		2	0.57
(Avira ®, Lead Crop Science Pvt. Ltd.).		1	0.29
Azoxystrobin (Amistar®, Syngenta).		1	0.29
Copper hydroxide (Champion®, Nufarm).		1	0.29

Tolclofos-methyl (Teramac®, Twiga Chemical Industries Ltd).		1	0.29
Propamocarp HCL (Dotan®, Chimac Agriphar).		1	0.29
Summer oil (Virol®, Makhteshim chemical works Ltd.).		1	0.29
Sulpher (Sulpher®, Agrindustria).		1	0.29
Copper Sulphate (Copper Sulphate®, Amia).		1	0.29
Dichloropropene (Kandor®, Dow Agrosciences).		1	0.29
Copper hydroxide (Kocide®, DUPONT).		1	0.29
Various copper pesticides.		1	0.29
Fenamiphos (Neemacor®, Bayer).		1	0.29
Thiocyclam hydrogen oxalate (Evisect®, Arysta lifscience co.).		1	0.29
Glyphosate Isopropy Amine Salt (Glyphos®, Luxembourg Chemical).		1	0.29
Chlorpyrifos (Dorbas®, Makhteshim Chemical Works Ltd.).		1	0.29
Abamectin (Romacten®, Rotam HK).		1	0.29
Triadimenol (Shavit®, chemical works Ltd.).		1	0.29
Lambda Cyhalothrin (Karate®, Syngenta).		1	0.29

Table (10) showed that 88% of participants (n=308) said that the use of pesticides was decided by the men; while 8% of participants (n=28) mentioned that the use of pesticides was decided by the women.

Regarding to the length of experience with using pesticides, it ranged between 4 months and 40 years table (10). Additionally, the result revealed that 128 participants are using pesticides continuously, which represent 36.6% from total sample; while 116 participants (33.1%) used pesticides occasionally; and 92 participants (26.3%) used pesticides in cases of necessity.

Table (10): Distribution of study participants by making decision of related pesticides to use

Item		Frequency	Percent
Who decides to use pesticides?	The man	308	88
	The woman	28	8
	The answer is no	14	4
	Total	350	100
How long have you been using pesticide " length of experience with using pesticides"?	I don’t know	65	18.57
	1 Year	6	1.71
	10 Months	1	0.29
	10 Years	66	18.86
	12 Years	4	1.14
	13 Years	1	0.29
	14 Years	1	0.29
	15 Years	20	5.71
	17 Years	1	0.29
	19 Years	5	1.43
	2 Years	18	5.14
	20 Years	14	4
	29 Years	7	2
	3 Years	26	7.43
	30 Years	7	2
	4 Months	1	0.29
	40 Years	16	4.57
	5 Years	49	14
	6 Months	1	0.29
	6 Years	8	2.29
	7 Years	14	4
	8 Years	5	1.43
	The answer is no.	14	4
	Total	350	100
Do you use these pesticides?	The answer is no.	14	4
	Continuously.	128	36.6
	Sometimes.	116	33.1
	In cases of necessity.	92	26.3
	Total	350	100

When the participants were asked about the reasons for applying pesticides; the study findings revealed that there were major differences among the participant’s answers (Table 11). Whereas, when the participants were asked if the immediate impact of pesticides on the pests, is one of the

reasons for applying pesticides, 317 participants (90.6% of the total participants) answered yes. While 33 participants (9.4%) answered no; while when the participants were asked if the ease access to pesticides, is one of the reasons for spreading pesticides, 254 participants (72.6%) answered yes. In comparison, 96 participants (27.4%) answered no. In addition, when the participants were asked if the ease of using pesticides, is one of the reasons for spreading pesticides, 243 participants (69.4%) answered yes, while 107 participants (30.6%) answered no. And when the participants were asked if the low price of pesticides is a reason for applying pesticides, 112 participants (32) answered yes, while 238 participants (68%) answered no. Moreover, Table (11) showed the order for the reasons of using pesticides based on their importance for the farmers; for example: in rank (a) of the causes of pesticide use, 262 participants (74.9%) said that the immediate impact of pesticides on the pests is the main reason for spreading pesticides. In comparison, 38 participants (10.9%) mentioned that the simple way of using pesticides is the main reason for spreading pesticides. However, 36 participants (10.3%) said that easy access to pesticides is the main reason for applying pesticides; finally, 14 participants (4%) reported that the low price of pesticides is the main reason for spreading pesticides Table (11).

Table (11): Distribution of study participants according to the main reasons for applying pesticides

Item		Frequency	Percent
Reasons for spreading pesticides:			
Rapid immediate on the pests.	Yes	317	90.6
	No	33	9.4
	Total	350	100
Ease of access.	Yes	254	72.6
	No	96	27.4
	Total	350	100
The way of use it is simple.	Yes	243	69.4
	No	107	30.6
	Total	350	100
The price is low.	Yes	112	32
	No	238	68
	Total	350	100
Through the previous question, rank reasons of spread pesticides - by importance:			
(a).	Rapid impact on the pests.	262	74.9
	The way of use it is simple.	38	10.9
	Ease of access.	36	10.3
	The price is cheap.	14	4
	Total	350	100
(b).	Ease of access.	203	58
	The way of use it is simple.	97	27.7
	Rapid impact on the pests.	28	8
	The price is cheap.	22	6.3
	Total	350	100
(c).	The way of use it is simple.	185	52.86
	Ease of access.	80	22.86
	The price is cheap.	43	12.29
	Rapid impact on the pests.	42	12
	Total	350	100
(d).	The price is cheap.	271	77.4
	Ease of access.	31	8.9
	The way of use it is simple.	30	8.6
	Rapid impact on the pests.	18	5.1
	Total	350	100

The study findings revealed differences between the participants according to the reasons for using pesticides. When the participants were asked if they use pesticides for protection purposes, 316 participants (represents 90.3% of the total participants) answered yes. While 34 participants (9.7%)

answered no. While when the participants were asked if they use pesticides when they see insects and note diseases, 294 participants (84%) answered yes, while 56 participants (16%) answered no. In addition, when the participants were asked if they use pesticides when the crop is damaged, 249 participants (71.1%) answered yes, while 101 participants (28.9%) answered no. Moreover, 193 participants (71.1%) used pesticides based on a recommendation from some other people (like other farmers); 130 participants (37.1%) used pesticides according to an annual schedule for the use of pesticides; 172 participants (49.1%) used pesticides based on advice from an agricultural extension agent. Finally, 108 participants (30.9%) used pesticides based on counseled from local media; see Table (12). As well as, the table showed the order of the reasons of using pesticides based on the importance for the farmer. For instance, in rank (a) of the reasons, 266 participants (76%) reported the first reason for using pesticides is for protection purposes; 61 participants (17.4%) told that the first reason for using pesticides is when they see insects and note diseases, While 16 participants (4.57%) told that the first reason for using pesticides is when the crop is damaged. On the contrary, the least reasons for applying pesticide by farmers can be summarized as; 2 participants (0.57%) told the first reason for using pesticides is according to the annual schedule for the use of pesticides; in addition 2 participants (0.57%) told that the first reason for using pesticides is based on counseled from an agricultural extension worker. 2 participants (0.57%) told that the first reason for using pesticides is based on counseled from local media. Finally, 1 participant (0.29%) told

that the first reason for using pesticides is based on counseled from some people (like other farmers). All ranks of reasons were displayed below based on their importance for the farmers.

Table (12): Distribution of study participants by reasons for using pesticides

Item		Frequency	Percent
Why do you use pesticides?			
Prevention and protection.	Yes	316	90.3
	No	**34**	**9.7**
	Total	**350**	**100**
See insects and note diseases.	Yes	294	84
	No	56	16
	Total	**350**	**100**
Crop damage.	Yes	249	71.1
	No	101	28.9
	Total	350	100
Counseled from some people (like other farmers).	Yes	193	55.1
	No	157	44.9
	Total	**350**	**100**
Usually, according to an annual schedule for the use of pesticides.	Yes	130	37.1
	No	220	62.9
	Total	**350**	**100**
Counseled from an agricultural extension worker.	Yes	172	49.1
	No	**178**	**50.9**
	Total	**350**	**100**
Counseled from Local media.	Yes	108	30.9
	No	242	69.1
	Total	**350**	**100**
Through the previous question, rank reasons of use pesticides -by importance:			
(a).	Prevention and protection.	266	76
	See insects and note diseases.	61	17.4
	Crop damage.	16	4.57
	Usually, according to an annual schedule for the use of pesticides.	2	0.57
	Counseled from an agricultural extension worker.	2	0.57
	Counseled from local media.	2	0.57
	Counseled from some people (like other farmers).	1	0.29
	Total	**350**	**100**

Item	Frequency	Percent	Item
(b).	See insects and note diseases.	220	62.86
	Crop damage.	74	21.14
	Prevention and protection.	24	6.86
	Counseled from some people (like other farmers).	17	4.86
	Counseled from an agricultural extension worker.	9	2.57
	Usually, according to an annual schedule for the use of pesticides.	6	1.71
	Total	**350**	**100**
(c).	Crop damage.	198	56.57
	See insects and note diseases.	41	11.71
	Counseled from some people (like other farmers).	38	10.86
	Prevention and protection.	31	8.86
	Usually, according to an annual schedule for the use of pesticides.	20	5.71
	Counseled from an agricultural extension worker.	18	5.14
	Counseled from local media.	4	1.14
	Total	**350**	**100**
(d).	Counseled from some people (like other farmers).	189	54
	Counseled from an agricultural extension worker.	51	14.57
	Usually, according to an annual schedule for the use of pesticides.	48	13.71
	Crop damage.	27	7.71
	Counseled from local media.	17	4.86
	See insects and note diseases.	11	3.14
	Prevention and protection.	7	2
	Total	**350**	**100**
(e).	Usually, according to an annual schedule for the use of pesticides.	160	45.71
	Counseled from some people (like other farmers).	60	17.14
	Counseled from an agricultural extension worker.	60	17.14
	Counseled from local media.	38	10.86
	Crop damage.	14	4
	See insects and note diseases.	10	2.86
	Prevention and protection.	8	2.29
	Total	**350**	**100**

Item	Frequency	Percent	Item
(f).	Counseled from an agricultural extension worker.	183	52.29
	Usually, according to an annual schedule for the use of pesticides.	60	17.14
	Counseled from some people (like other farmers).	31	8.86
	Prevention and protection.	8	2.29
	Crop damage.	8	2.29
	See insects and note diseases.	6	1.71
	Counseled from local media.	54	15.43
	Total	**350**	**100**
(g).	Counseled from local media.	236	67.43
	Usually, according to an annual schedule for the use of pesticides.	53	15.14
	Counseled from an agricultural extension worker.	26	7.43
	Counseled from some people (like other farmers).	16	4.57
	Crop damage.	12	3.43
	Prevention and protection.	6	1.71
	See insects and note diseases.	1	0.29
	Total	**350**	**100**

Table (13) indicated the distribution of the study participants according to their consideration for weather conditions when they use pesticides, 309 participants (which represent 88.3% of the total sample) took into account the appropriate weather conditions when they apply pesticides (such as the wind direction while spraying pesticides); 41 participants (11.7%) didn't take into account the appropriate weather conditions when they use pesticides.

Also, Table (13) described the time when the participants spray the pesticide. It showed that 189 participants (54%) used pesticides early in the morning; while 30 participants (8.6%) used pesticides at the noon time; and 131 participants (37.4%) used pesticides in the evening.

Table (13): Distribution of study participants according to their consideration for weather conditions when using pesticides.

Item		Frequency	Percent
Do you take into account the appropriate weather conditions when using pesticides (such as taking into account the wind direction while spraying pesticides)?	Yes	309	88.3
	No	41	11.7
	Total	350	100
When do you spray pesticides?	Early in the morning.	189	54
	At noon time.	30	8.6
	In the evening	131	37.4
	Total	350	100

The majority of participants (n=214, which represents 61.1% from total sample) knew the quantity of pesticides that they had used; while 136 participants (38.9%) didn’t know the quantity of pesticides that they had used; see Table (14). Regarding the quantity that the participants use per month; Table (14) indicated these quantities in details.

Table (14): Distribution of study participants according to pesticides quantity used in their farms

Item		Frequency	Percent
Do you know the quantity of pesticides you use?	Yes	214	61.1
	No	136	38.9
	Total	350	100
If yes, specify the quantity you use each month:	0,5 Liters	1	0.29
	0.25 Liters	2	0.57
	0.5 Liter	1	0.29
	0.5 Liters	3	0.86
	1 Liter	2	0.57
	1 Liters	12	3.43
	1.5 Liters	5	1.43
	10 Liters	22	6.29
	100 grams	1	0.29
	100 Milli Liter	1	0.29
	150 Milli Liter	1	0.29
	2 Liters	17	4.86
	2.5 Liters	1	0.29
	20 Liters	3	0.86
	200 grams	3	0.86
	3 Liters	19	5.43
	4 Liters	16	4.57
	5 Liters	40	11.43
	6 Liters	6	1.71
	7 Liters	12	3.43
	8 Liters	11	3.14
	9 Liters	1	0.29
	As needed	34	9.71
	The answer is no	**136**	**38.86**
	Total	**350**	**100**

Regarding the pesticide's preparation, Figure (21) described the distribution of study participants by the person who is responsible for preparing pesticides (Taking into account that there was more than one person is responsible for preparing the pesticide). It showed that the owner of the farm prepared the pesticides (286 participants; 81.7%); the agricultural engineer or technician agricultural prepared the pesticides for 121 participants (34.6%); while the agricultural worker prepared the pesticides for 167 participants (47.7%).

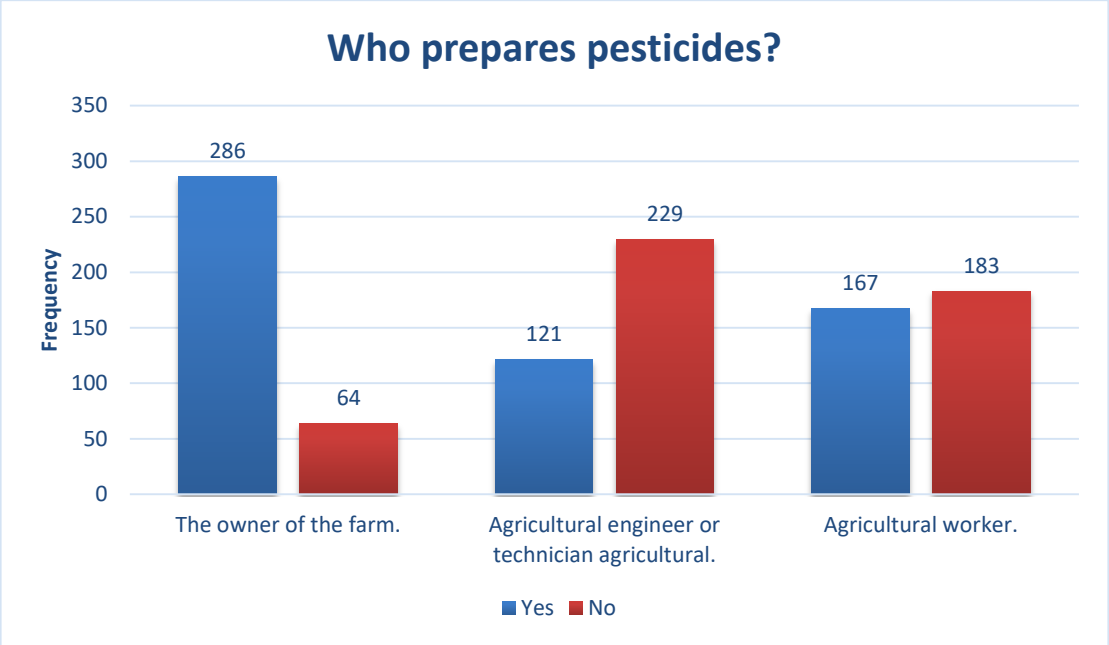

Figure (21): Distribution of study participants according to in-charged person for pesticides preparation.

For pesticide selection, Figure (22) showed the distribution of study participants by the person who chooses the right pesticide (Taking into account that there was more than one person responsible for pesticide selection). It shows that 133 participants (32.3%) depended on relatives, friends, neighbors & other farmers to select the right pesticide; 263 participants (75.1%) depended on personal experiences gained from dealing with pesticides to select the right pesticide; 243 participants (69.4%) depended on pesticide dealers to select the right pesticide; finally, 196 participants (56%) depended on agricultural extension to select the right pesticide.

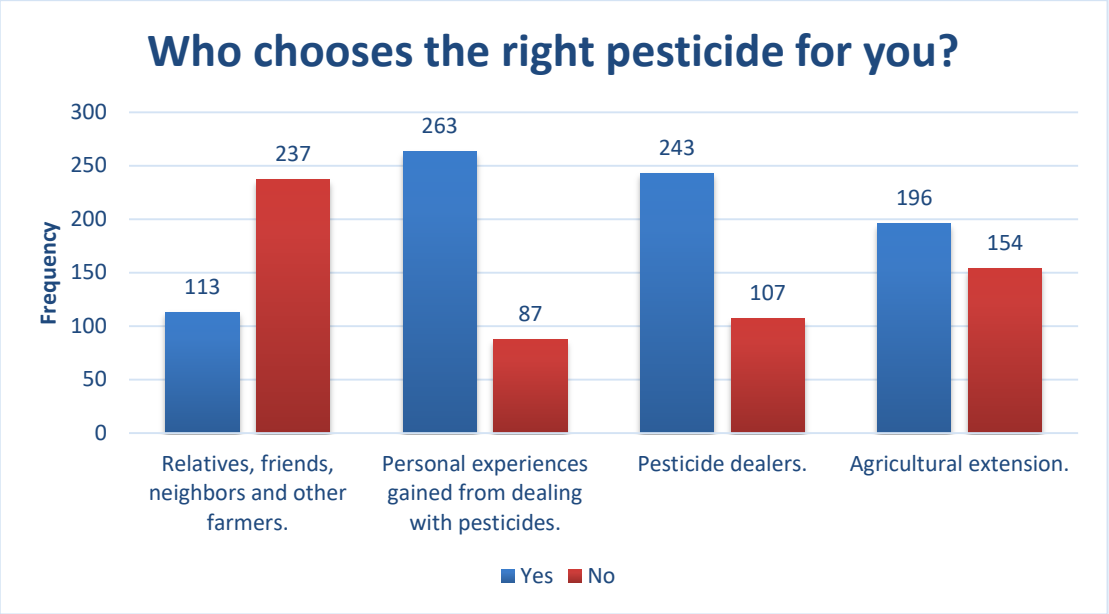

Figure (22): Distribution of study participants by decision made for pesticide selection.

Regarding pesticide dose, Figure (23) described the distribution of study participants by the person who determines the dose of the pesticide (Taking into account that there was more than one person responsible for determining the dose of the pesticide). It showed that 102 participants (29.1%) depended on relatives, friends, neighbors & other farmers to determine the dose of the pesticide. While, 245 participants (70%) relied on personal experiences gained from dealing with pesticides to determine the dose of the pesticide; 251 participants (71.1%) depended on pesticide dealers to determine the dose of the pesticide; finally, 203 participants (58%) depended on the agricultural extension to determine the dose of the pesticide.

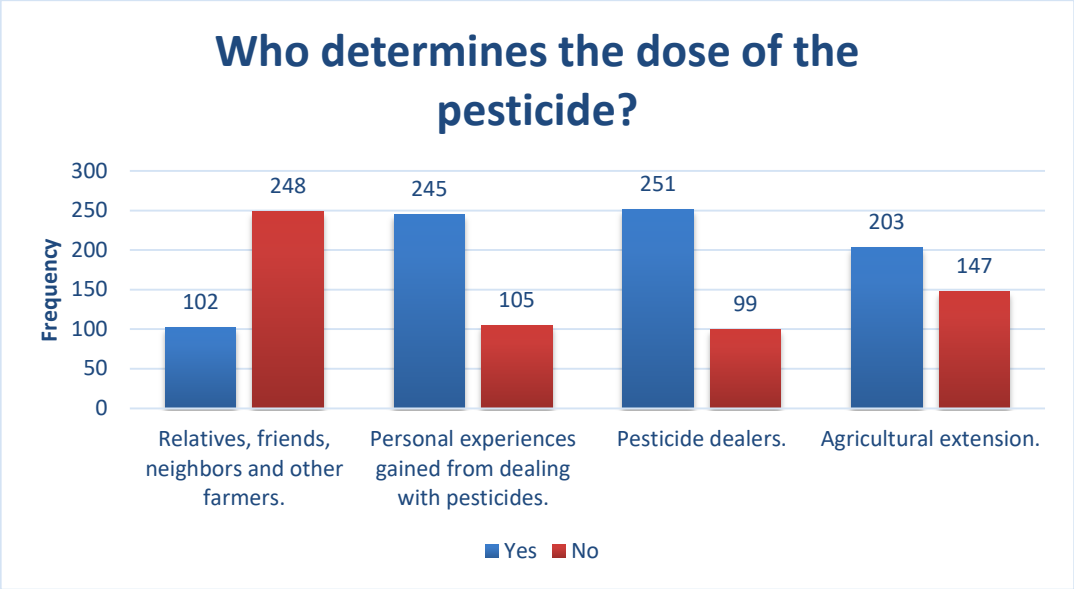

Figure (23): Distribution of study participants by decision made for determine the dose of the pesticide.

The distribution of study participants by follow recommendation and instructions are represented in Table (15) which showed that the majority of participants (n=321, represents (91.7%) of the total sample) were stick to the recommended pesticide's dose; while 29 participants (8.3%) did not stick to the recommended pesticide's dose.

Also, 291 participants (which represent 83.1% of the total sample) read the information on the pesticide card and follow the written instructions; while 59 participants (16.9%) didn’t read the information on the pesticide label sheet & didn't follow the written instructions.

The study findings revealed that the reasons for not reading the information on the pesticide label & not following the written instructions were the instructions are often written in small print; written instructions are numerous and boring; lack of interest; illiteracy; difficult to understand it; not enough time to read it; having previous experiences, and purchased pesticides without written instructions.

Table (15): Distribution of study participants by follow recommendation and instructions

Item		Frequency	Percent
Do you adhere to the recommended dose?	Yes	321	91.7
	No	29	8.3
	Total	350	100
Do you read the information on the pesticide card and follow the written instructions?	Yes	291	83.1
	No	59	16.9
	Total	350	100
If the answer is no, why?	The answer is yes.	291	83.14
	The instructions are often written in small print.	4	1.14
	Written instructions are numerous and boring.	5	1.43
	Lack of interest.	8	2.29
	Illiteracy.	20	5.71
	Difficult to understand it.	4	1.14
	Not enough time to read it.	5	1.43
	Having a past experiences.	4	1.14
	Purchased without written instructions.	9	2.57
	Total	350	100

Regarding to mixing of pesticides, Table (16) showed that the majority of participants (n=316, which represents 90.3% of the total sample) sprayed two or more mixed pesticides; in which 252 participants sprayed two or more mixed pesticides because it is more effective in controlling pests and diseases, 230 participants sprayed two or more mixed pesticides to eliminate many different types of pests simultaneously, 144 participants sprayed two or more mixed pesticides to reduce the cost of labor, and 205 participants sprayed two or more mixed pesticides to save time and effort; while 34 participants (9.7%) didn't spray two or more mixed pesticides.

Also, Table (16) described the chemical mixing place, and showed that 152 participants (43.4%) mixed pesticides outside the place of use, while 164 participants (46.9%) mixed pesticides inside the place of use. At the same

way, 85 participants (24.3%) mixed pesticides in a closed place, while 231 participants (66%) mixed pesticides in an open place.

Table (16): Distribution of study participants by mixing the pesticides

Item		Frequency	Percent
Do you spray two or more mixed pesticides?	Yes	316	90.3
	No	34	9.7
	Total	350	100
Reasons for mixing pesticides:			
More effective in controlling pests and diseases.	Yes	252	72
	No	64	18.3
	The answer is no	34	9.7
	Total	350	100.0
To eliminate many different types of pests simultaneously.	Yes	230	65.7
	No	86	24.6
	The answer is no	34	9.7
	Total	350	100
To reduce the cost of labor.	Yes	144	41.1
	No	172	49.1
	The answer is no	34	9.7
	Total	350	100
To save time and effort.	Yes	205	58.6
	No	111	31.7
	The answer is no	34	9.7
	Total	350	100
Chemical mixing place:			
A	Outside the place of use.	152	43.4
	Inside the place of use.	164	46.9
	The answer is no	34	9.7
	Total	350	100
B	Closed.	85	24.3
	Open and airy.	231	66
	The answer is no	34	9.7
	Total	350	100

When the participants were asked about the sources of information about pesticide; the study findings revealed that there were differences between the participants according to this question. When the participants were asked about the source of the information they get to deal with the pesticide "its use, storage and disposal". 238 participants answered that they used releases guidance as a source of information about pesticide; 248

participants used the pesticide label; 145 participants depended on relatives, friends, neighbors and other farmers. While 256 participants depended on personal experiences gained from dealing with pesticides; 265 participants depended on pesticide dealers; 182 participants depended on government agricultural guide; 124 participants depended on agricultural extension from non-governmental organizations; finally, 108 participants depended on TV programs, radio, newspapers, magazines; as indicated in table (17). Moreover, the table showed the sources of information about pesticide based on their importance for the farmer; for example: in rank (a) of the sources, 184 participants (52.57%) told that the releases guidance is a first source of information; 60 participants (17.14%) told that the pesticide label is a first source of information; 16 participants (4.57%) told that the relatives, friends, neighbors and other farmers are the first source of information; 32 participants (9.14%) told that the personal experiences gained from dealing with pesticides is a first source of information; 36 participants (10.29%) told that the pesticide dealers is a first source of information; 14 participants (4%) told that the government agricultural guide is a first source of information; 7 participants (2%) told that the agricultural extension from non-governmental organizations is a first source of information; finally, 1 participant (0.29%) told that the TV programs, radio, newspapers, magazines are the first source of information. All ranks of sources were displayed below based on their importance for the farmer.

Table (17): Distribution of study participants by source of information about pesticide

Item		Frequency	Percent
The source of the information you get to deal with the pesticide "its use, storage and disposal":			
Releases guidance	Yes	238	68
	No	112	32
	Total	350	100
Pesticide card	Yes	248	70.9
	No	102	29.1
	Total	350	100
Relatives, friends, neighbors and other farmers	Yes	145	41.4
	No	205	58.6
	Total	350	100
Personal experiences gained from dealing with pesticides	Yes	256	73.1
	No	94	26.9
	Total	350	100
Pesticide dealers	Yes	265	75.7
	No	85	24.3
	Total	350	100
Government agricultural guide	Yes	182	52
	No	168	48
	Total	350	100
Agricultural extension from non-governmental organizations	Yes	124	35.4
	No	226	64.6
	Total	350	100
TV programs, radio, newspapers, magazines	Yes	108	30.9
	No	242	69.1
	Total	350	100
Through the previous question, rank sources - by importance:			
(a).	Releases guidance	184	52.57
	Pesticide card	60	17.14
	Relatives, friends, neighbors and other farmers	16	4.57
	Personal experiences gained from dealing with pesticides	32	9.14
	Pesticide dealers	36	10.29
	Government agricultural guide	14	4
	Agricultural extension from non-governmental organizations	7	2
	TV programs, radio, newspapers, magazines	1	0.29
	Total	**350**	**100**

(b).	Releases guidance	31	8.86
	Pesticide card	159	45.43
	Relatives, friends, neighbors and other farmers	31	8.86
	Personal experiences gained from dealing with pesticides	48	13.71
	Pesticide dealers	41	11.71
	Government agricultural guide	21	6
	Agricultural extension from non-governmental organizations	13	3.71
	TV programs, radio, newspapers, magazines	6	1.71
	Total	**350**	**100**
(c).	Releases guidance	24	6.86
	Pesticide card	38	10.86
	Relatives, friends, neighbors and other farmers	98	28
	Personal experiences gained from dealing with pesticides	78	22.29
	Pesticide dealers	67	19.14
	Government agricultural guide	28	8
	Agricultural extension from non-governmental organizations	10	2.86
	TV programs, radio, newspapers, magazines	7	2
	Total	**350**	**100**
(d).	Releases guidance	35	10
	Pesticide card	38	10.86
	Relatives, friends, neighbors and other farmers	41	11.71
	Personal experiences gained from dealing with pesticides	105	30
	Pesticide dealers	69	19.71
	Government agricultural guide	33	9.43
	Agricultural extension from non-governmental organizations	21	6
	TV programs, radio, newspapers, magazines	8	2.29
	Total	**350**	**100**
(e).	Releases guidance	41	11.71
	Pesticide card	27	7.71
	Relatives, friends, neighbors and other farmers	51	14.57
	Personal experiences gained from dealing with pesticides	30	8.57
	Pesticide dealers	101	28.86
	Government agricultural guide	61	17.43
	Agricultural extension from non-governmental organizations	25	7.14
	TV programs, radio, newspapers, magazines	14	4

	Total	**350**	**100**
(f).	Releases guidance	20	5.71
	Pesticide card	13	3.71
	Relatives, friends, neighbors and other farmers	41	11.71
	Personal experiences gained from dealing with pesticides	26	7.43
	Pesticide dealers.	17	4.86
	Government agricultural guide	135	38.57
	Agricultural extension from non-governmental organizations	46	13.14
	TV programs, radio, newspapers, magazines	52	14.86
	Total	**350**	**100**
(g).	Releases guidance	8	2.29
	Pesticide card	10	2.86
	Relatives, friends, neighbors and other farmers	37	10.57
	Personal experiences gained from dealing with pesticides	22	6.29
	Pesticide dealers	11	3.14
	Government agricultural guide	33	9.43
	Agricultural extension from non-governmental organizations	165	47.14
	TV programs, radio, newspapers, magazines.	64	18.29
	Total	**350**	**100**
(h).	Releases guidance	5	1.43
	Pesticide card	5	1.43
	Relatives, friends, neighbors and other farmers	36	10.29
	Personal experiences gained from dealing with pesticides	11	3.14
	Pesticide dealers	7	2
	Government agricultural guide	24	6.86
	Agricultural extension from non-governmental organizations	64	18.29
	TV programs, radio, newspapers, magazines	198	56.57
	Total	**350**	**100**

Table (18) described the distribution of study participants by actions related to pesticides spraying, it showed that 172 participants (49.1%) their crop was affected or damaged due to a failure to follow the appropriate dose or

as a result of choosing an inappropriate pesticide, while 178 participants (50.9%) their crop was not affected.

On the other hand, 155 participants (44.3%) put a warning sign on the field sprayed with pesticides; while 195 participants (55.7%) did not use a warning sign.

In addition, 164 participants (46.9%) sprayed pesticides in before pests infestation occurred; while 186 participants (53.1%) didn't. The reasons of this practice were high effective protection (n=63), reducing pest density in upcoming crops (n=27), and high effective prevention and reducing pest density in upcoming crops (n=74).

Table (18): Distribution of study participants by actions related to pesticides spraying

Item		Frequency	Percent
Has your crop been affected or damaged due to a failure to adhere to the appropriate dose or as a result of choosing an inappropriate pesticide?	Yes	172	49.1
	No	178	50.9
	Total	350	100
Are you placing a warning sign on the field sprayed with pesticides or where the pesticides are?	Yes	155	44.3
	No	195	55.7
	Total	350	100
Do you spray in cases of lack of pests?	Yes	164	46.9
	No	186	53.1
	Total	350	100
If the answer is yes, specify the reason:	The answer is no	186	53.14
	High effective prevention.	63	18
	Reducing pest density in upcoming crops.	27	7.71
	High effective prevention and Reducing pest density in upcoming crops.	74	21.14
	Total	**350**	**100**

A.4.4 Distribution of study participants by their knowledge about health and safety procedures while using pesticides

Table (19) described the distribution of study participants according to received training and knowledge about using pesticides, for pests & diseases management. It showed that 143 participants (represent 40.9% of the total sample) were trained for safety measures while using pesticides, among them 63 participants were trained by governmental organizations; 48 participants were trained by private institutions; and 32 participants were trained by non-governmental organizations. While 207 participants did not have any training for safety measures while using pesticides.

Also, Table (19) shows that 151 participants (43.1%) attended training courses to raise awareness about the dangers of pesticides to health and the environment; while 199 participants (56.9%) didn't attend to any courses.

131 participants (37.4%) were trained in integrated pest management, insect and disease identification and prevention; while 219 participants (62.6%) did not have any training in integrated pest management, insect and disease identification and prevention.

In addition, 253 participants (72.3%) looked for information sources to develop their knowledge about pesticides; these sources are mentioned in Table (19); while 97 participants (27.7%) did not look for any information sources to develop their knowledge about pesticides.

Moreover, table (19) showed that 252 participants (72%) sought for courses on the safe use of pesticides; while 98 participants (28%) didn't seek for courses on the safe use of pesticides.

Furthermore, 298 participants (85.1%) were interested to find appropriate solutions to reduce the excessive use of pesticides; while 52 participants (14.9%) didn't interest to find any appropriate solutions to reduce the excessive use of pesticides.

On the other hand, Table (19) showed that the majority of participants (n=317, which represent 90.6%) thought that there is a need to optimize and manage the use of pesticides; while 33 participants (9.4%) did not think there is a need to manage the use of pesticides. Also 321 participants (91.7%) thought that there is a need to conduct scientific research related to the dangers of pesticides, while 29 participants (8.3%) didn't think that there is any need to conduct scientific research related to the dangers of pesticides. As well as, 329 participants (94%) thought that the safety precautions are useful for protecting against the negative effects of pesticides, while 21 participants (6%) did not think that the safety precautions are useful for protecting against the negative effects of pesticides.

Table (19): Distribution of study participants by received training and gained knowledge about using pesticides, and pests & diseases management

Item		Frequency	Percent
Have you been trained for safety measures while using pesticides?	Yes	143	40.9
	No	207	59.1
	Total	350	100
If yes, specify who trained you:	Governmental organizations.	63	18
	A private institution.	48	13.71
	Non-governmental organizations.	32	9.14
	The answer is no	207	59.14
	Total	350	100
Did you attend to courses to raise awareness about the dangers of pesticides to health and the environment?	Yes	151	43.1
	No	199	56.9
	Total	350	100
Have you been trained in integrated pest management, insect and disease identification and prevention?	Yes	131	37.4
	No	219	62.6
	Total	350	100
Are you looking for information sources to develop your knowledge about pesticides?	Yes	253	72.3
	No	97	27.7
	Total	350	100
If the answer is yes, mention these sources:			
Agricultural institutions (whether governmental, such as the Ministry of Agriculture, or private or non-governmental organizations).		71	20.29
Internet.		52	14.86
Experienced and competent people.		22	6.29
Agricultural extension.		18	5.14
Dealers selling pesticides.		13	3.71
Releases guidance.		10	2.86
Agricultural magazines.		9	2.57
Agricultural engineer.		7	2
Other farmers.		6	1.71
Newspapers.		3	0.86
Various media.		3	0.86
Relatives.		2	0.57
Television.		2	0.57
Neighbors.		1	0.29
Radio.		1	0.29
Books.		1	0.29
Are you seeking to take courses on the safe use of pesticides?	Yes	252	72
	No	98	28

	Total	350	100
Are you interesting in knowing appropriate solutions to reduce the excessive use of pesticides?	Yes	298	85.1
	No	52	14.9
	Total	350	100
Do you think there is a need to rationalize the use of pesticides?	Yes	317	90.6
	No	33	9.4
	Total	350	100
Do you think that there is a need to conduct scientific research related to the dangers of pesticides?	Yes	321	91.7
	No	29	8.3
	Total	350	100
Do you think safety precautions are useful for protecting against the negative effects of pesticides?	Yes	329	94
	No	21	6
	Total	350	100

Regarding to precautions for using pesticides in agriculture land, Table (20) describes the distribution of study participants by applying the precautions for using pesticides in agriculture land. Whereas each precaution and its frequency & percentage are illustrated below.

Table (20): Distribution of study participants by applying the precautions for using pesticides in agriculture land

Item		Frequency	Percent
Precautions for using pesticides in agriculture land:			
Read the pesticide label before use.	Never.	47	13.4
	Sometimes.	128	36.6
	Most of the time.	175	50
	Total	350	100
Calculate the required amount for spraying.	Never.	30	8.6
	Sometimes.	117	33.4
	Most of the time.	203	58
	Total	350	100
Confirm the expiration date.	Never.	40	11.43
	Sometimes.	116	33.14
	Most of the time.	194	55.43
	Total	350	100
Examination of insect and disease samples before using the pesticide.	Never.	107	30.57
	Sometimes.	150	42.86
	Most of the time.	93	26.57
	Total	350	100
Use personal protective equipment (special clothing, etc.) when dealing with pesticides and chemicals.	Never.	53	15.14
	Sometimes.	160	45.71
	Most of the time.	137	39.14
	Total	350	100

Check spray equipment before using pesticides.	Never.	50	14.3
	Sometimes.	142	40.6
	Most of the time.	158	45.1
	Total	350	100
Use hands to mix without protection.	Never.	191	54.6
	Sometimes.	119	34
	Most of the time.	40	11.4
	Total	350	100
Use custom mixing tools.	Never.	52	14.9
	Sometimes.	145	41.4
	Most of the time.	153	43.7
	Total	350	100
Clean the spray tools after finishing the spraying process.	Never.	29	8.3
	Sometimes.	120	34.3
	Most of the time.	201	57.4
	Total	350	100
Hand washing after using pesticides.	Never.	28	8
	Sometimes.	77	22
	Most of the time.	245	70
	Total	350	100
Change clothes after spraying.	Never.	29	8.3
	Sometimes.	95	27.1
	Most of the time.	226	64.6
	Total	350	100
Bathing with soap and water after finishing the spraying process.	Never.	84	24
	Sometimes.	104	29.7
	Most of the time.	162	46.3
	Total	350	100
Smoking while handling and using pesticides.	Never.	233	66.6
	Sometimes.	92	26.3
	Most of the time.	25	7.1
	Total	350	100
Eat or drink while handling and using pesticides.	Never.	260	74.3
	Sometimes.	65	18.6
	Most of the time.	25	7.1
	Total	350	100
Allow entry to farm animals immediately after spraying.	Never.	234	66.9
	Sometimes.	90	25.7
	Most of the time.	26	7.4
	Total	350	100
Adhere to the pre-harvest interval period of the pesticide.	Never.	50	14.3
	Sometimes.	107	30.6
	Most of the time.	193	55.1
	Total	350	100

Regarding to using the personal protective equipment when preparing or using the pesticide, Table (21) described the distribution of study participants by using the personal protective equipment. Each personal protective equipment and its frequency & percentage are illustrated below.

In addition, Table (21) showed the reasons for not wearing personal protective equipment. It was found that 163 participants didn’t wear the personal protective equipment, because of its expensive price; 146 participants didn’t wear the personal protective equipment, because of it is not available; 156 participants didn’t wear the personal protective equipment, because of the difficulty to obtain it; 5 participants didn’t wear the personal protective equipment, because they think that it is not necessary; 9 participants didn’t wear the personal protective equipment, because of the difficulty of working with it; 9 participants didn’t wear the personal protective equipment, because of personal laziness and neglect; finally, 2 participants didn’t wear the personal protective equipment, because of they didn’t know anything about it.

Table (21): Distribution of study participants by using personal protective equipment

Item		Frequency	Percent
Which personal protective equipment do you use when preparing or using the pesticide?			
Protective clothing.	I do not use it.	69	19.7
	I use it sometimes.	155	44.3
	I use it most of the time.	126	36
	Total	350	100
Hand gloves.	I do not use it.	43	12.3
	I use it sometimes.	142	40.6
	I use it most of the time.	165	47.1
	Total	350	100
Cap.	I do not use it.	52	14.9
	I use it sometimes.	151	43.1
	I use it most of the time.	147	42
	Total	350	100
Face mask.	I do not use it.	97	27.7
	I use it sometimes.	155	44.3
	I use it most of the time.	98	28
	Total	350	100
Special shoes.	I do not use it.	87	24.86
	I use it sometimes.	143	40.86
	I use it most of the time.	120	34.29
	Total	350	100
Goggles.	I do not use it.	109	31.14
	I use it sometimes.	144	41.14
	I use it most of the time.	97	27.71
	Total	350	100
If you do not wear, is the reason:			
Expensive price.	Yes	163	46.6
	No	164	46.9
Not available.	Yes	146	41.7
	No	181	51.7
Difficult to obtain.	Yes	156	44.6
	No	171	48.9
Others.	I think it is not necessary.	5	1.43
	The difficulty of working with it.	9	2.57
	Personal laziness and neglect.	9	2.57
	I do not know anything about it.	2	.57
How do you wash the clothes that you used to spray pesticides?	Wash alone.	297	84.9
	Wash with other clothes at home.	53	15.1
	Total	350	100

A.4.5 Distribution of study participants according to their knowledge of health effects of pesticide use

The study findings revealed that the majority of participants (n=340, which represent 97.1% of the total sample) knew that exposure to pesticides has a harmful effect on health; while 10 participants (2.9%) didn't know that; see Table (22).

Moreover, the majority of participants (n=283) didn't have poisoning from pesticides either to themselves or to their children; while 67 participants had poisoning from pesticides. All signs and symptoms that felt by the participants (during or after using pesticides) are mentioned in Table (22).

Table (22): Distribution of study participants according to their knowledge of health effects of pesticide use

Item		Frequency	Percent
Do you know that exposure to pesticides has a harmful effect on health?	Yes	340	97.1
	No	10	2.9
	Total	350	100
Have you, one of your children or agricultural workers in your land ever had poisoning from pesticides?	Yes	67	19.1
	No	283	80.9
	Total	350	100
During or after using pesticides, did you feel any of the following signs and symptoms:			
Excessive sweating.	It did not occur.	207	59.1
	Sometimes occur.	121	34.6
	Always occur.	22	6.3
	Total	350	100
Feeling pain and itchy eyes.	It did not occur.	165	47.1
	Sometimes occur.	164	46.9
	Always occur.	21	6
	Total	350	100
Dryness and sore throat.	It did not occur.	199	56.9
	Sometimes occur.	131	37.4
	Always occur.	20	5.7
	Total	350	100
General fatigue or exhaustion from any effort.	It did not occur.	193	55.14
	Sometimes occur.	130	37.14
	Always occur.	27	7.71
	Total	350	100
Dizziness.	It did not occur.	224	64
	Sometimes occur.	110	31.4
	Always occur.	16	4.6
	Total	350	100
Skin disorders (redness, white spots, cramps, ulcers)	It did not occur.	177	50.6
	Sometimes occur.	154	44
	Always occur.	19	5.4
	Total	350	100
Muscle weakness.	It did not occur.	222	63.4
	Sometimes occur.	112	32
	Always occur.	16	4.6
	Total	350	100
Runny nose.	It did not occur.	184	52.57
	Sometimes occur.	143	40.86
	Always occur.	23	6.57
	Total	350	100
Blurred vision.	It did not occur.	219	62.57
	Sometimes occur.	107	30.57

	Always occur.	24	6.86
	Total	350	100
Chest pain.	It did not occur.	221	63.1
	Sometimes occur.	105	30
	Always occur.	24	6.9
	Total	350	100
Breathing problems.	It did not occur.	190	54.3
	Sometimes occur.	141	40.3
	Always occur.	19	5.4
	Total	350	100
Coughing.	It did not occur.	169	48.29
	Sometimes occur.	157	44.86
	Always occur.	24	6.86
	Total	350	100
Frequent saliva.	It did not occur.	225	64.3
	Sometimes occur.	100	28.6
	Always occur.	25	7.1
	Total	350	100
Tremor.	It did not occur.	245	70
	Sometimes occur.	91	26
	Always occur.	14	4
	Total	350	100
Nausea or vomiting.	It did not occur.	245	70
	Sometimes occur.	93	26.6
	Always occur.	12	3.4
	Total	350	100
Pain in the stomach and abdomen.	It did not occur.	228	65.14
	Sometimes occur.	103	29.43
	Always occur.	19	5.43
	Total	350	100
Diarrhea.	It did not occur.	238	68
	Sometimes occur.	89	25.4
	Always occur.	23	6.6
	Total	350	100

The variables about medical management in the case of injuries due to using pesticides are distributed in Table (23) which shows that the majority of participants (n=246) were sure that the type of pesticide that they usually used is authorized and safe to use; and 104 participants were not sure if the type of pesticide that they usually used is authorized and safe to use.

Also, Table (23) shows that 144 participants (41.1%) mentioned that they had a first aid kits in the farm, for use in the case of injuries; while 206 participants (58.9%) didn’t have a first aid kits in the farm.

Furthermore, 245 participants (70%) answered that there was a medical treatment center in their area that provides medical services to farmers. While 54 participants (15.4%) mentioned there is some difficulties in reaching the health center in their neighborhood. these difficulties mostly due to the road from the farm to the health center was unpaved, the distance from the farm to the health center was far, health staff were working for limited periods "not 24 hours", unavailability of a car, lack of transportation, there was no ambulance, and lack of complete treatment & analysis in the nearby health center, Whereas, 105 participants (30%) answered that there was no medical treatment center in their neighborhood area that provides medical services to farms in the case of any accidental injury.

Moreover, 158 participants (45.1%) answered that there was a toll-free "Ministry of Health" emergency number to call when pesticide toxicity occurs and to inquire how to treat and deal with it; while 192 participants (54.9%) answered that there was no toll-free "Ministry of Health" emergency number.

As well as, 144 participants (41.1%) answered that there was a contact number on the package of the pesticide used, when the toxicity of pesticides occurs to inquire about how to deal with it; while 206

participants (58.9%) answered that there was no contact number on the package of the pesticide used, when the toxicity of pesticides occurs to inquire about how to deal with it.

Table (23): Distribution of study participants by health caution, and difficulties **in the case of injuries due to using pesticides**

Item		Frequency	Percent
Are you sure that the pesticide you are using is authorized and safe to use?	Yes	246	70.3
	No	104	29.7
	Total	350	100
Are there on-farm first aid kits for use in the case of injuries?	Yes	144	41.1
	No	206	58.9
	Total	350	100
In the event of an injury: Is there a medical treatment center in your area that provides medical services to farms?	Yes	245	70
	No	105	30
	Total	350	100
If the answer is yes, are there any difficulties in reaching the center?	Yes	54	15.4
	No	191	54.6
	The answer is no	105	30
	Total	350	100
Determine what these difficulties:			
The road from the farm to the health center is unpaved.		5	1.43
The distance from the farm to the health center is far.		4	1.14
Health staff working for limited periods (not 24 hours).		2	0.57
Unavailability of a car.		2	0.57
Lack of transportation.		2	0.57
There is no ambulance.		2	0.57
Lack of complete treatment and analysis in the nearby health center.		1	0.29
Is there a toll-free "Ministry of Health" emergency number to call when pesticide toxicity occurs and to inquire how to treat and deal with it?	Yes	158	45.1
	No	192	54.9
	Total	350	100
Is there a contact number on the package of the pesticide used, when the toxicity of pesticides occurs to inquire about how to deal with it?	Yes	144	41.1
	No	206	58.9
	Total	350	100

A.4.6 Distribution of study participants by according to their actions when storing pesticides

Regarding to the site of storing pesticides; Table (24) showed that 128 participants (36.6%) were storing pesticides in an open space; 250 participants (71.4%) were storing pesticides in a special storage room for pesticides; 203 participants (58%) were storing pesticides in a special place in agricultural land; 90 participants (25.7%) were storing pesticides at their homes; and 202 participants (57.7%) were buying only as needed.

Table (24) showed that 313 participants (89.4%) were keeping the pesticide in a good protected, shaded and ventilated place, while 37 participants (10.6%) didn't keep the pesticide in a good protected, shaded and ventilated place.

Moreover, 170 participants (48.6%) were classifying pesticides during storage, according to the degree of toxicity; while 1780 participants (51.4%) didn't classify pesticides when they stored it.

Table (24): Distribution of study participants according to the site conditions they have for storage pesticides

Item		Frequency	Percent
Where do you store pesticides?			
In an open space.	Yes	128	36.6
	No	222	63.4
	Total	350	100
In a dedicated storage room for pesticides.	Yes	250	71.4
	No	100	28.6
	Total	350	100
In a special place in agricultural land.	Yes	203	58
	No	147	42
	Total	350	100
At home.	Yes	90	25.7
	No	260	74.3
	Total	350	100
Buy only as needed.	Yes	202	57.7
	No	148	42.3
	Total	350	100
Do you keep the pesticide in a good shaded and ventilated place?	Yes	313	89.4
	No	37	10.6
	Total	350	100
When pesticides are stored, do you classify it according to the degree of seriousness?	Yes	170	48.6
	No	180	51.4
	Total	350	100

When asking participants about the disposal of empty pesticide containers; the study findings revealed that there were differences between the participants according to this question. 31 participants answered that they used it for home uses like storing food or drinks; 79 participants answered that they used it to store another type of pesticide; 246 participants answered that they threw it in the landfill; 112 participants answered that they threw it randomly anywhere; 155 participants answered that they burnt it outdoors; 117 participants answered that they buried it under the soil; finally 79 participants answered that they asked for help from the Ministry of Agriculture to dispose it; see Table (25). As well as the table showed the sort of these actions based on their importance for the farmer; for example:

in rank (a) of the actions, 37 participants (10.57%) mentioned that the first action is use it for home uses like storing food or drinks; 41 participants (11.71%) told that the first action is use it to store another type of pesticide; 185 participants (52.86%) told that the first action is throw it in the landfill; 28 participants (8%) told that the first action is throw it randomly anywhere; 23 participants (10.57%) told that the first action is burn it outdoors; 19 participants (10.57%) told that the first action is bury it under the soil; 17 participants (10.57%) told that the first action is asking help from the Ministry of Agriculture to dispose of it; All ranks of actions were displayed below based on their importance for the farmer.

Table (25): Distribution of studied participants according to their actions for the disposal of empty pesticide containers

Item		Frequency	Percent
What do you do with empty pesticide container?			
I use it for home uses like storing food or drinks.	Yes	31	8.9
	No	319	91.1
	Total	350	100
I use it to store another type of pesticide.	Yes	79	22.6
	No	271	77.4
	Total	350	100
I throw it in the landfill.	Yes	246	70.3
	No	104	29.7
	Total	350	100
I throw it randomly anywhere.	Yes	112	32
	No	238	68
	Total	350	100
I burn it outdoors.	Yes	155	44.3
	No	195	55.7
	Total	350	100
I bury it under the soil.	Yes	117	33.4
	No	233	66.6
	Total	350	100
I am asking for help from the Ministry of Agriculture to dispose of it.	Yes	79	22.6
	No	271	77.4
	Total	350	100

With the previous question, sort - according to the most used:			
(a)	I use it for home uses like storing food or drinks.	37	10.57
	I use it to store another kind of pesticide.	41	11.71
	I throw it in the landfill.	185	52.86
	I throw it randomly anywhere.	28	8
	I burn it outdoors.	23	6.57
	I bury it under the soil.	19	5.43
	I am asking for help from the Ministry of Agriculture to dispose of it.	17	4.86
	Total	350	100
(b).	I use it for home uses like "storing food or drinks".	10	2.86
	I use it to store another kind of pesticide.	87	24.86
	I throw it in the landfill.	59	16.86
	I throw it randomly anywhere.	63	18
	I burn it outdoors.	71	20.29
	I bury it under the soil.	41	11.71
	I am asking for help from the Ministry of Agriculture to dispose of it.	19	5.43
	Total	350	100
(c).	I use it for home uses like "storing food or drinks".	13	3.71
	I use it to store another kind of pesticide.	42	12
	I throw it in the landfill.	52	14.86
	I throw it randomly anywhere.	89	25.43
	I burn it outdoors.	77	22
	I bury it under the soil.	50	14.29
	I am asking for help from the Ministry of Agriculture to dispose of it.	27	7.71
	Total	350	100
(d).	I use it for home uses like "storing food or drinks".	15	4.29
	I use it to store another kind of pesticide.	39	11.14
	I throw it in the landfill.	25	7.14
	I throw it randomly anywhere.	80	22.86
	I burn it outdoors.	80	22.86
	I bury it under the soil.	73	20.86
	I am asking for help from the Ministry of Agriculture to dispose of it.	38	10.86
	Total	350	100

(e).	I use it for home uses like "storing food or drinks".	25	7.14
	I use it to store another kind of pesticide.	48	13.71
	I throw it in the landfill.	19	5.43
	I throw it randomly anywhere.	43	12.29
	I burn it outdoors.	70	20
	I bury it under the soil.	80	22.86
	I am asking for help from the Ministry of Agriculture to dispose of it.	65	18.57
	Total	350	100
(f).	I use it for home uses like "storing food or drinks".	27	7.71
	I use it to store another kind of pesticide.	78	22.29
	I throw it in the landfill.	6	1.71
	I throw it randomly anywhere.	36	10.29
	I burn it outdoors.	22	6.29
	I bury it under the soil.	70	20
	I am asking for help from the Ministry of Agriculture to dispose of it.	111	31.71
	Total	350	100
(g).	I use it for home uses like "storing food or drinks".	222	63.43
	I use it to store another kind of pesticide.	17	4.86
	I throw it in the landfill.	5	1.43
	I throw it randomly anywhere.	12	3.43
	I burn it outdoors.	5	1.43
	I bury it under the soil.	17	4.86
	I am asking for help from the Ministry of Agriculture to dispose of it.	72	20.57
	Total	350	100

Table (26) showed the distribution of study participants by public awareness-raising and educational training on the safe and environmentally disposal of agricultural pesticide containers. It showed that 114 participants (32.6%) were trained on the safe and environmentally disposal of agricultural pesticide containers. Among them 75 participants were trained by the governmental sector, while 23 participants were trained by private

institutions, and 16 participants were trained by non-governmental organizations. On other hand, 236 participants (67.4%) didn't have any training about the safe and environmentally disposal of agricultural pesticide containers.

Table (26): Distribution of studied participants according to enrolment in educational training on environmentally safe disposal of pesticide containers

Item		Frequency	Percent
In your country, is there awareness-raising and educational campaigns on the safe and environmentally disposal of agricultural pesticide containers?	Yes	114	32.6
	No	236	67.4
	Total	350	100
If the answer is yes, specify who carried out these training courses:	The answer is no	236	67.4
	Governmental entity.	75	21.4
	A private institution.	23	6.6
	Non-governmental organizations.	16	4.6
	Total	350	100

When asking participants about their actions toward the residue and non-used quantities of pesticides; the study findings revealed that there were differences between the participants according to this question. Whereas, 247 participants answered that they used the entire purchased quantities; 79 participants answered that they threw it in wastewater; 90 participants answered that they threw it out in open places; 178 participants answered that they threw it in specific places; 106 participants answered that they buried it under the soil; 81 participants answered that they threw it in the farm; 80 participants answered that they sprayed pesticides on land that is not being used for any purpose; 87 participants answered that they return the remaining quantities to the source of purchase; 5 participants answered

that they stored and kept it to be used again when needed; finally, 1 participant answered that he threw it in the landfill; see Table (27).

Table (27): Distribution of studied participants according to the method of residue and non-used quantities pesticides disposal

Item		Frequency	Percent
How to get rid of the remaining quantities of pesticides?			
Use the entire purchased quantities.	Yes	247	70.6
	No	103	29.4
	Total	350	100
Throw it in wastewater.	Yes	79	22.6
	No	271	77.4
	Total	350	100
Throw it out in open places.	Yes	90	25.7
	No	260	74.3
	Total	350	100
Throw it in specific places.	Yes	178	50.9
	No	172	49.1
	Total	350	100
Bury it under the soil.	Yes	106	30.3
	No	244	69.7
	Total	350	100
Throw it in the farm.	Yes	81	23.1
	No	269	76.9
	Total	350	100
Spraying pesticides on land that is not being used for any purpose.	Yes	80	22.9
	No	270	77.1
	Total	350	100
Return the remaining quantities to the source of purchase.	Yes	87	24.9
	No	263	75.1
	Total	350	100
Others, mention:	Store and keep it to be used again when needed.	5	1.43
	Throw it in the landfill.	1	0.29

Table (28) showed the distribution of study participants by application of warning procedures in the place of storing pesticides, it shows that the majority of participants (n=267) didn’t store fuel and flammable materials in the same place of pesticides stored; while 83 participants were storing fuel and flammable materials in the same place of pesticides stored. At the

same way, it shows that the majority of participants (n=253) didn’t have a fire extinguisher in the place of storing pesticides; while 97 participants had a fire extinguisher in the place of storing pesticides. Also, it showed that the majority of participants (n=231) didn’t mark "no smoking" signs near where pesticides are stored; while 119 participants were marking "no smoking" signs near where pesticides are stored.

Table (28) showed that 291 participants (83.1%) were storing pesticides and chemicals out of children's hand reach; while 59 participants (16.9%) didn’t store pesticides and chemicals out of children's hand reach. In addition, it shows that 160 participants (45.7%) placed a clear warning label on each storage container to warn of the dangers of chemicals or pesticides; while 190 participants (54.3%) didn’t place a clear warning label on each storage container to warn of the dangers of chemicals or pesticides. Finally, 201 participants (57.4%) mentioned that they had a certain place to store highly dangerous pesticides; while 149 participants (52.6%) told that they didn’t have a dedicated place to store highly dangerous pesticides.

Table (28): Distribution of study participants by application of warning signs in the place of storing pesticides

Item		Frequency	Percent
Do you store fuel and flammable materials in the same place of pesticides stored?	Yes	83	23.7
	No	267	76.3
	Total	350	100
Is there a fire extinguisher in the place of storing pesticides?	Yes	97	27.7
	No	253	72.3
	Total	350	100
Are "no smoking" signs marked near where pesticides are stored?	Yes	119	34
	No	231	66
	Total	350	100
Are pesticides and chemicals stored out of children's reach?	Yes	291	83.1
	No	59	16.9
	Total	350	100
Is a clear warning label placed on each storage container to warn of the dangers of chemicals or pesticides?	Yes	160	45.7
	No	190	54.3
	Total	350	100
Is there a dedicated place to store highly dangerous pesticides?	Yes	201	57.4
	No	149	42.6
	Total	350	100

A.4.7 Distribution of study participants by identification of the environmental impacts of pesticide use

Table (29) showed that the number of participants who agreed that pesticides affect plant diversity and contribute to the toxicity of plants and crops is 318 participants and represent 90.9% of the total sample; while 32 participants (9.1%) didn’t agree. While the number of participants who agreed that the use of pesticides leads to air pollution with toxic compounds is 328 participants and represent 93.7% from total sample; while 22 participants (6.3%) didn’t agree. Moreover, 315 participants (90%) of total sample agreed that the failure to adhere to the preharvest interval of the pesticide will result in the pesticide residues remaining in vegetables and fruits; while 35 participants (10%) didn’t agree.

Furthermore, the number of participants who agreed that the intensive use of pesticides negatively affects the beneficiary microorganisms in the soil is 303 participants and represent 86.6% of the total sample; while 47 participants (13.4%) didn't agree. In addition, the number of participants who agreed that pesticides contribute to soil pollution for long periods and reduce its fertility is 323 participants and represent 92.3% from total sample; while 27 participants (7.7%) did not agree.

Table (29) showed that 323 participants (92.3%) knew that pesticides affect the balance of insects and natural pollinators; while 27 participants (7.7%) didn't know. In addition, 317 participants (90.6%) knew that pesticides affect animals; while 33 participants (9.4%) did not know.

As well as, Table (29) showed that 270 participants (77.1%) mentioned that their farm animals had no harm due to exposure to pesticides or ingestion of sprayed plants. while 80 participants (22.9%) reported that their farm animals were harmed by exposure to pesticides or ingestion of sprayed plants, these harms were (poisoning, death, various diseases, diarrhea, loss of appetite, and abortion).

Table (29): Distribution of studied participants according to their knowledge on identification of the environmental impacts of pesticide use

Item		Frequency	Percent
Do you agree that pesticides affect plant diversity and contribute to the toxicity of plants and crops?	Yes	318	90.9
	No	32	9.1
	Total	350	100
Do you agree that the use of pesticides leads to air pollution with toxic compounds?	Yes	328	93.7
	No	22	6.3
	Total	350	100
Do you agree that failure to adhere to the preharvest interval of the pesticide will result in the pesticide residues remaining in vegetables and fruits?	Yes	315	90
	No	35	10
	Total	350	100
Do you agree that the use of pesticides in large quantities leads to the elimination of living organisms in the soil?	Yes	303	86.6
	No	47	13.4
	Total	350	100
Do you agree that pesticides contribute to soil pollution for long periods and reduce its fertility?	Yes	323	92.3
	No	27	7.7
	Total	350	100
Did you know that pesticides affect the balance of insects and natural pollinators?	Yes	323	92.3
	No	27	7.7
	Total	350	100
Did you know that pesticides affect animals?	Yes	317	90.6
	No	33	9.4
	Total	350	100
Have your farm animals been harmed by exposure to pesticides or ingestion of sprayed plants?	Yes	80	22.9
	No	270	77.1
	Total	350	100
If yes, what are the harms?			
Poisoning		44	12.57
Death		13	3.71
Various diseases		10	2.86
Diarrhea		6	1.71
Loss of appetite		4	1.14
Abortion		3	0.86

A.4.8 Distribution of study participants according to the challenges they faced and suggestions

Regarding to obstacles that facing farms in Tulkarm, Table (30) describe the distribution of study participants by these obstacles "from the point of view of the farmer". Whereas each obstacle and its frequency & percentage is illustrated below.

Table (30): Distribution of study participants by obstacles that facing farms in Tulkarm, "from the point of view of the farmer"

Item	Frequency	Percent
The difficulty of marketing agricultural products.	116	33.14
Little or no agricultural extension, guidance and awareness.	83	23.71
Shortage of water or high purchase price.	68	19.43
High prices of fertilizers and agricultural pesticides.	55	15.71
The large number of diseases that affect crops.	49	14
Harassment and practices of the Israeli occupation and land confiscation.	48	13.71
Lack of financial support to farmers.	35	10
Low or fluctuating prices of selling products.	33	9.43
Frequent spread of insects and agricultural pests.	28	8
Weather conditions fluctuate.	20	5.71
High prices of agricultural supplies, seedlings and seeds.	19	5.43
The spread of wild animals such as pigs, mole and stray dogs.	17	4.86
Lack of production.	17	4.86
The small number of workers.	14	4
Weak or polluted soil.	12	3.43
Lack of agricultural expertise.	12	3.43
Lack of control over the sale or use of pesticides.	11	3.14
High production costs in general.	10	2.86
Neglect or absence of the role of the government and agricultural institutions and their lack of interest in the agricultural field.	10	2.86
Unavailability or difficulty in obtaining some materials and supplies.	8	2.29
I do not know.	8	2.29
High wages for workers.	7	2
The difficulty of access to agricultural land.	5	1.43
The numbers and areas of agricultural holdings are few.	5	1.43

Item	Frequency	Percent
Inability to export agricultural products.	4	1.14
Mismanagement and lack of planning in agriculture.	4	1.14
The inability of the farmer to recognize the pests and determine the appropriate pesticide.	4	1.14
Israeli competition for products.	4	1.14
Unavailability of all classes of pesticides.	3	0.86
lack of another system (such as organic pesticides) to control diseases other than chemical pesticides.	3	0.86
Low level of income.	2	0.57
Overgrazing.	2	0.57
Urban sprawl.	2	0.57
Pest resistance to pesticides.	2	0.57
The spread of weeds.	1	0.29
Soil erosion.	1	0.29
Fires.	1	0.29
Difficulty transporting products.	1	0.29
The amount of capital allocated to agriculture is small	1	0.29
Farmers lack of knowledge of alternative pest control methods.	1	0.29
Lack of rain.	1	0.29
Lack of reliable information sources in the agricultural field.	1	0.29

At the same way, Table (31) describes the distribution of study participants by their suggestions to reduce the risks of pesticides in Tulkarm. Whereas each suggestion and its frequency & percentage are illustrated below.

Table (31): Distribution of study participants by farmers suggestions to reduce the risks of pesticides in Tulkarm

Item	Frequency	Percent
Educating farmers and providing them with agricultural guidance through courses, scientific lectures or scientific publications.	204	58.29
Urging to reduce as much as possible the use of agricultural pesticides and not to use the pesticides at random way.	77	22
Control the stores of agricultural pesticides and determine the types of pesticides allowed to be used by the Directorate of Agriculture.	46	13.14
Financial support to farmers and to agricultural sector in general.	41	11.71
Follow prevention and protection measures (such as wearing protective clothing when using pesticides).	34	9.71
Adhere to the instructions and the recommended quantity.	27	7.71
Urging and encouraging farmers to organic agriculture.	24	6.86
I do not know.	11	3.14
Adhere to the specified preharvest interval for each pesticide.	7	2
Spraying collectively.	7	2
Use of natural alternative methods in controlling agricultural pests and diseases.	7	2
Resort to experienced people and ask them when using pesticides.	8	2
Storing pesticides in suitable and safe places.	6	1.71
Proper disposal of empty pesticide packaging or pesticide residue after use.	5	1.43
Wash spray tools after use.	5	1.43
Use of pesticides in a timely manner and taking into account weather conditions.	3	0.86
Not to mix pesticides together.	3	0.86
Diversity in crops and taking into account the type of crop when choosing the type of pesticide.	2	0.57
Wash hands with soap and water after spraying.	2	0.57
Conducting experiments on pesticides and their impact on the environment.	1	0.29
Examine the pesticide efficiency and continuously check pesticide residues in agricultural products.	1	0.29
Use the seeds or seedlings that are resistant to diseases.	1	0.29
Put a warning signs on the sprayed farm with pesticides.	1	0.29

B. Testing the study hypotheses

B.4.1 The first null hypothesis (H01)

H01: stated that there is no significant impact of the geographical location on the farmer's knowledge on the safe use of agricultural pesticides and safety measures implementation at the level of $\alpha \leq 0.05$.

The results in Table (32) clearly indicated no significant differences were found between the geographical location of farmers and {farmer's considering the appropriate weather conditions when applying pesticides. reading the information on the pesticide card & following the written instructions; and spraying two or more mixed pesticides}. Therefore, and due to the fact that $p > 0.05$, the null hypothesis failed to be rejected, and the analysis found no significant difference, therefore the H0 is accepted.

Also, there were significant differences between geographical location and (using pesticides in agricultural land; knowing the amount of used pesticides; using the recommended dose; and placing a warning sign on the field sprayed with pesticides or where the pesticides are), "P value was less than 0.05; Therefore, I reject the null hypothesis".

Table (32): Relationship between geographical location and farmer's knowledge of safe use of agricultural pesticides

Item	Living area				Chi-Square	P-value
	Al Sha'rawiya. n (%)	Al-Kafriyat. n (%)	Wadi Alshaeir. n (%)	Tulkarem city and its suburbs. n (%)		
Do you use pesticides in agricultural land?						
Yes	86 (91.5)	80 (100)	93 (100)	77 (92.8)	14.442	0.002
No	8 (8.5)	0 (0)	0 (0)	6 (7.2)		
Total	94 (100)	80 (100)	93 (100)	83 (100)		
Do you take into account the appropriate weather conditions when using pesticides?						
Yes	84 (89.4)	68 (85)	80 (86)	77 (92.8)	3.016	0.389
No	10 (10.6)	12 (15)	13 (14)	6 (7.2)		
Total	94 (100)	80 (100)	93 (100)	83 (100)		
Do you know the amount of pesticides you use?						
Yes	71 (75.5)	42 (52.5)	59 (63.4)	42 (50.6)	14.795	0.002
No	23 (24.5)	38 (47.5)	34 (36.6)	41 (49.4)		
Total	94 (100)	80 (100)	93 (100)	83 (100)		
Do you adhere to the recommended dose?						
Yes	87 (92.6)	76 (95)	79 (84.9)	79 (95.2)	8.142	0.043
No	7 (7.4)	4 (5)	14 (15.1)	4 (4.8)		
Total	94 (100)	80 (100)	93 (100)	83 (100)		
Do you read the information on the pesticide card and follow the written instructions?						
Yes	83 (88.3)	61 (76.3)	74 (79.6)	73 (88)	6.711	0.082
No	11 (11.7)	19 (23.8)	19 (20.4)	10 (12)		
Total	94 (100)	80 (100)	93 (100)	83 (100)		
Do you spray two or more mixed pesticides?						
Yes	88 (93.6)	67 (83.75)	85 (91.4)	76 (91.6)	5.372	0.146
No	6 (6.4)	13 (16.25)	8 (8.6)	7 (8.4)		
Total	94 (100)	80 (100)	93 (100)	83 (100)		
Are you placing a warning sign on the field sprayed with pesticides or where the pesticides are?						
Yes	32 (34)	33 (41.25)	45 (48.4)	45 (54.2)	8.248	0.041
No	62 (66)	47 (58.25)	48 (51.6)	38 (45.8)		
Total	94 (100)	80 (100)	93 (100)	83 (100)		

***P≤0.05: Significant, P>0.05: Not significant; n: number of the subjects; %: Percentage.**

In the same way, Table (33) showed that there were no significant differences were found between the geographical location and (reading the pesticide label before use; confirm the expiration date; examination of

insect and disease samples before using the pesticide; use personal protective equipment when dealing with pesticides and chemicals; use hands to mix without protection; clean the spray tools after finishing the spraying process; hand washing after using pesticides; change clothes after spraying; bathing with soap and water after finishing the spraying process; smoking while handling and using pesticides; eat or drink while handling and using pesticides; allow entry to farm animals immediately after spraying; and, adhere to the pre-harvest interval period of the pesticide) Therefore, and due to the fact that p> 0.05, the null hypothesis failed to be rejected, and the analysis found no significant difference, therefore the H0 is accepted.

While, there were statistically significant differences between geographical location and (calculate the required amount for spraying; check spray equipment before using pesticides; and use custom mixing tools) "P value was less than 0.05; Therefore, I reject the null hypothesis".

Table (33): Relationship between geographical location and safety measures implementation.

Item	Living area				Chi-Square	P-value
	Al Sha'rawiya. n (%)	Al-Kafriyat. n (%)	Wadi Alshaeir. n (%)	Tulkarem city and its suburbs. n (%)		
Precautions "safety measures" for using pesticides in agriculture land:						
Read the pesticide label before use.						
Never.	12 (12.8)	13(16.25)	17 (18.3)	5 (6)	8.848	0.182
Sometimes.	30 (31.9)	27(33.25)	37 (39.8)	34 (41)		
Most of the time.	52 (55.3)	40 (50)	39 (41.9)	44 (53)		
Total	94 (100)	80 (100)	93 (100)	83 (100)		
Calculate the required amount for spraying.						
Never.	14 (14.9)	4 (5.0)	11 (11.8)	1 (1.2)	18.546	0.005

Sometimes.	27 (28.7)	33 (41.3)	34 (36.6)	23 (27.7)		
Most of the time.	53 (56.4)	43 (53.8)	48 (51.6)	59 (71.1)		
Total	94 (100)	80 (100)	93 (100)	83 (100)		
Confirm the expiration date.						
Never.	10 (10.6)	11(13.75)	15 (16.1)	4 (4.8)	10.096	0.121
Sometimes.	34 (36.2)	31(38.75)	27 (29.1)	24 (28.9)		
Most of the time.	50 (53.2)	38 (47.5)	51 (54.8)	55 (66.3)		
Total	94 (100)	80 (100)	93 (100)	83 (100)		
Examination of insect and disease samples before using the pesticide.						
Never.	20 (21.3)	28 (35)	31 (33.3)	28 (33.7)	7.398	0.286
Sometimes.	45 (47.85)	28 (35)	41 (44.1)	36 (43.4)		
Most of the time.	29 (30.85)	24 (30)	21 (22.6)	19 (22.9)		
Total	94 (100)	80 (100)	93 (100)	83 (100)		
Use personal protective equipment (special clothing, etc.) when dealing with pesticides and chemicals.						
Never.	10 (10.6)	13(16.25)	19 (20.4)	11 (13.25)	4.648	0.590
Sometimes.	42 (44.7)	38 (47.5)	40 (43)	40 (48.2)		
Most of the time.	42 (44.7)	29(36.25)	34 (36.6)	32 (38.55)		
Total	94 (100)	80 (100)	93 (100)	83 (100)		
Check spray equipment before using pesticides.						
Never.	9 (9.6)	13(16.25)	22 (23.7)	6 (7.3)	16.031	0.014
Sometimes.	43 (45.7)	37 46.25)	31 (33.3)	31 (37.3)		
Most of the time.	42 (44.7)	30 (37.5)	40 (43.0)	46 (55.4)		
Total	94 (100)	80 (100)	93 (100)	83 (100)		
Use hands to mix without protection.						
Never.	49 (52.13)	44 (55)	48 (51.6)	50 (60.24)	2.932	0.817
Sometimes.	35 (37.23)	28 (35)	31 (33.3)	25 (30.12)		
Most of the time.	10 (10.64)	8 (10)	14 (15.1)	8 (9.64)		
Total	94 (100)	80 (100)	93 (100)	83 (100)		
Use custom mixing tools.						
Never.	12 (12.8)	14 (17.5)	15 (16.1)	11 (13.3)	14.516	0.024
Sometimes.	44 (46.8)	39 48.25)	40 (43)	22 (26.5)		
Most of the time.	38 (40.4)	27 33.25)	38 (40.9)	50 (60.2)		
Total	94 (100)	80 (100)	93 (100)	83 (100)		
Clean the spray tools after finishing the spraying process.						
Never.	6 (6.4)	6 (7.5)	11 (11.8)	6 (7.2)	3.906	0.689
Sometimes.	36 (38.3)	30 (37.5)	29 (31.2)	25 (30.1)		
Most of the	52 (55.3)	44 (55)	53 (57)	52 (62.7)		

time.						
Total	94 (100)	80 (100)	93 (100)	83 (100)		
Hand washing after using pesticides.						
Never.	6 (6.4)	3 (3.25)	11 (11.8)	8 (9.6)	11.483	0.075
Sometimes.	26 (27.6)	23 28.25)	17 (18.3)	11 (13.3)		
Most of the time.	62 (66)	54 (67.5)	65 (69.9)	64 (77.1)		
Total	94 (100)	80 (100)	93 (100)	83 (100)		
Change clothes after spraying.						
Never.	8 (8.5)	7 (8.25)	10 (10.8)	4 (4.8)	3.791	0.705
Sometimes.	27 (28.7)	24 (30)	20 (21.5)	24 (28.9)		
Most of the time.	59 (62.8)	49 61.25)	63 (67.7)	55 (66.3)		
Total	94 (100)	80 (100)	93 (100)	83 (100)		
Bathing with soap and water after finishing the spraying process.						
Never.	23 (24.4)	22 (27.5)	26 (28)	13 (15.7)	7.653	0.265
Sometimes.	34 (36.2)	21 26.25)	24 (25.8)	25 (30.1)		
Most of the time.	37 (39.4)	37 46.25)	43 (46.2)	45 (54.2)		
Total	94 (100)	80 (100)	93 (100)	83 (100)		
Smoking while handling and using pesticides.						
Never.	61 (64.9)	55 68.25)	64 (68.8)	53 (63.9)	1.221	0.976
Sometimes.	26 (27.7)	19 23.25)	24 (25.8)	23 (27.7)		
Most of the time.	7 (7.4)	6 (7.5)	5 (5.4)	7 (8.4)		
Total	94 (100)	80 (100)	93 (100)	83 (100)		
Eat or drink while handling and using pesticides.						
Never.	68 (72.35)	59 73.25)	70 (75.3)	63(75.9)	1.288	0.972
Sometimes.	18 (19.15)	14 (17.5)	18 (19.3)	15 (18.1)		
Most of the time.	8 (8.5)	7 (8.25)	5 (5.4)	5 (6)		
Total	94 (100)	80 (100)	93 (100)	83 (100)		
Allow entry to farm animals immediately after spraying.						
Never.	62 (66)	55 68.25)	60 (64.5)	57 (68.7)	7.385	0.287
Sometimes.	23 (24.5)	16 (20)	30 (32.3)	21 (25.3)		
Most of the time.	9 (9.5)	9 (11.25)	3 (3.2)	5 (6.0)		
Total	94 (100)	80 (100)	93 (100)	83 (100)		
Adhere to the pre-harvest interval period of the pesticide.						
Never.	15 (16)	11 13.25)	15 (16.1)	9 (10.8)	10.976	0.089
Sometimes.	23 (24.5)	29 36.25)	36 (38.7)	19 (22.9)		
Most of the time.	56 (59.4)	40 (50)	42 (45.2)	55 (66.3)		
Total	94 (100)	80 (100)	93 (100)	83 (100)		

***P≤0.05: Significant, P>0.05: Not significant; n: number of the subjects; %: Percentage.**

B.4.2 Testing the second hypothesis (H02)

H02: hypothesis stated that there is no significant impact of the farmer's education level on the farmer's knowledge of the safe use of agricultural pesticides and safety measures implementation at the level of $\alpha \leq 0.05$.

The results in Table (34) clearly indicated no significant differences were found between education level and {using pesticides in agricultural land; taking into account the appropriate weather conditions when using pesticides; knowing the amount of used pesticides; adhere to the recommended dose; spraying two or more mixed pesticides; and placing a warning sign on the field sprayed with pesticides or where the pesticides are} Therefore, and due to the fact that $p > 0.05$, the null hypothesis failed to be rejected, and the analysis found no significant difference, therefore the H0 is accepted.

Also, there were significant differences between education level and reading the information on the pesticide card & following the written instructions, "P value was less than 0.05; Therefore, I reject the null hypothesis".

Table (34): Relationship between education level and farmer's knowledge of safe use of agricultural pesticides

Item	Educational level						Chi-Square	P-value
	Less than high school. n (%)	High school. n (%)	Diploma. n (%)	Bachelor. n (%)	Master. n (%)	Doctorate. n (%)		
Do you use pesticides in agricultural land?								
Yes	70 (97.2)	91 (95.8)	65 (94.2)	90 (95.7)	18 (100)	2 (100)	1.721	0.886
No	2(2.8)	4(4.2)	4(5.8)	4 (4.3)	0 (0)	0 (0)		
Total	72 (100)	95 (100)	69 (100)	94 (100)	18 (100)	2 (100)		
Do you take into account the appropriate weather conditions when using pesticides?								
Yes	63 (87.5)	86 (90.5)	62 (89.9)	80 (85.1)	16 (88.9)	2 (100)	1.859	0.868
No	9(12.5)	9(9.5)	7 (10.1)	14(14.9)	2(11.1)	0 (0)		
Total	72 (100)	95 (100)	69 (100)	94 (100)	18 (100)	2 (100)		
Do you know the amount of pesticides you use?								
Yes	52 (72.2)	60 (63.2)	39 (56.5)	49 (52.1)	13 (72.2)	1 (50)	8.753	0.119
No	20 (27.8)	35 (36.8)	30 (43.5)	45 (47.9)	5 (27.8)	1 (50)		
Total	72 (100)	95 (100)	69 (100)	94 (100)	18 (100)	2 (100)		
Do you adhere to the recommended dose?								
Yes	65 (90.3)	87 (91.6)	62 (89.9)	89 (94.7)	16 (88.9)	2 (100)	1.970	0.853
No	7 (9.7)	8 (8.4)	7 (10.1)	5 (5.3)	2 (11.1)	0 (0)		
Total	72 (100)	95 (100)	69 (100)	94 (100)	18 (100)	2 (100)		
Do you read the information on the pesticide card and follow the written instructions?								
Yes	49 (68.1)	76 (80)	61 (88.4)	89 (94.7)	15 (83.3)	1 (50)	24.223	0.000
No	23 (31.9)	19 (20)	8 (11.6)	5 (5.3)	3 (16.7)	1 (50)		
Total	72 (100)	95 (100)	69 (100)	94 (100)	18 (100)	2 (100)		
Do you spray two or more mixed pesticides?								
Yes	65 (90.3)	84 (88.4)	64 (92.8)	85 (90.4)	16 (88.9)	2 (100)	1.113	0.953
No	7 (9.7)	11 (11.6)	5 (7.2)	9 (9.6)	2 (11.1)	0 (0)		
Total	72 (100)	95 (100)	69 (100)	94 (100)	18 (100)	2 (100)		

Are you placing a warning sign on the field sprayed with pesticides or where the pesticides are?								
Yes	32 (44.4)	38 (40)	37 (53.6)	43 (45.7)	5 (27.8)	0 (0)	6.805	0.236
No	40 (55.6)	57 (60)	32 (46.4)	51 (54.3)	13 (72.2)	2 (100)		
Total	72 (100)	95 (100)	69 (100)	94 (100)	18 (100)	2 (100)		

***P≤0.05: Significant, P>0.05: Not significant; n: number of the subjects; %: Percentage.**

In addition Table (35) showed that there were no significant differences were found between education level and {examination of insect and disease samples before using the pesticide; use personal protective equipment when dealing with pesticides and chemicals; check spray equipment before using pesticides; use hands to mix without protection; use custom mixing tools; bathing with soap and water after finishing the spraying process; smoking while handling and using pesticides; eat or drink while handling and using pesticides; allow entry to farm animals immediately after spraying; and adhere to the pre-harvest interval period of the pesticide} Therefore, and due to the fact that p> 0.05, the null hypothesis failed to be rejected, and the analysis found no significant difference, therefore the H0 is accepted.

Also, there were statistically significant differences between education level and {reading the pesticide label before use; calculate the required amount for spraying; confirm the expiration date; clean the spray tools after finishing the spraying process; hand washing after using pesticides; and change clothes after spraying) "P value was less than 0.05; Therefore, I reject the null hypothesis".

Table (35): Relationship between education level and safety measures implementation

Item	Educational level						Chi-Square	P-value
	Less than high school. n (%)	High school. n (%)	Diploma. n (%)	Bachelor. n (%)	Master. n (%)	Doctorate. n (%)		
Precautions "safety measures" for using pesticides in agriculture land:								
Read the pesticide label before use.								
Never.	14 (19.4)	12 (12.6)	10 (14.5)	8 (8.5)	1 (5.6)	2 (100)	21.897	0.016
Sometimes.	31 (43.1)	34 (35.8)	23 (33.3)	34 (36.2)	6 (33.3)	0 (0)		
Most of the time.	27 (37.5)	49 (51.6)	36 (52.2)	52 (55.3)	11 (61.1)	0 (0)		
Total	72 (100)	95 (100)	69 (100)	94 (100)	18 (100)	2 (100)		
Calculate the required amount for spraying.								
Never.	10 (13.9)	8 (8.4)	4 (5.8)	5 (5.3)	1 (5.55)	2 (100)	39.599	0.000
Sometimes.	35 (48.6)	28 (29.5)	21 (30.4)	26 (27.7)	7 (38.9)	0 (0)		
Most of the time.	27 (37.5)	59 (62.1)	44 (63.8)	63 (67)	10 (55.55)	0 (0)		
Total	72 (100)	95 (100)	69 (100)	94 (100)	18 (100)	2 (100)		
Confirm the expiration date.								
Never.	10 (13.9)	13 (13.6)	8 (11.6)	8 (8.5)	0 (0)	1 (50)	20.782	0.023
Sometimes.	35 (48.6)	24 (25.3)	21 (30.4)	30 (31.9)	5 (27.8)	1 (50)		
Most of the time.	27 (37.5)	58 (61.1)	40 (58)	56 (59.6)	13 (72.2)	0 (0)		
Total	72 (100)	95 (100)	69 (100)	94 (100)	18 (100)	2 (100)		
Examination of insect and disease samples before using the pesticide.								
Never.	24 (33.3)	26 (27.4)	17 (24.7)	32 (34)	7 (38.9)	1 (50)	9.617	0.475
Sometimes.	36 (50)	37 (38.9)	33 (47.8)	37 (39.4)	6 (33.3)	1 (50)		
Most of the time.	12 (16.7)	32 (33.7)	19 (27.5)	25 (26.6)	5 (27.8)	0 (0)		
Total	72 (100)	95 (100)	69 (100)	94 (100)	18 (100)	2 (100)		

Use personal protective equipment (special clothing, etc.) when dealing with pesticides and chemicals.								
Never.	15 (20.8)	13 (13.7)	10 (14.5)	13 (13.8)	1 (5.6)	1 (50)	17.371	0.067
Sometimes.	28 (38.9)	41 (43.15)	25 (36.2)	52 (55.3)	13 (72.2)	1 (50)		
Most of the time.	29 (40.3)	41 (43.15)	34 (49.3)	29 (30.9)	4 (22.2)	0 (0)		
Total	72 (100)	95 (100)	69 (100)	94 (100)	18 (100)	2 (100)		
Check spray equipment before using pesticides.								
Never.	14 (19.4)	11 (11.6)	10 (14.5)	10 (10.6)	4 (22.2)	1 (50)	11.423	0.326
Sometimes.	30 (41.7)	38 (40)	24 (34.8)	39 (41.5)	10 (55.6)	1 (50)		
Most of the time.	28 (38.9)	46 (48.4)	35 (50.7)	45 (47.9)	4 (22.2)	0 (0)		
Total	72 (100)	95 (100)	69 (100)	94 (100)	18 (100)	2 (100)		
Use hands to mix without protection.								
Never.	33 (45.83)	53 (55.8)	35 (50.7)	60 (63.8)	10 (55.6)	0 (0)	15.523	0.114
Sometimes.	32 (44.45)	30 (31.6)	21 (30.45)	28 (29.8)	6 (33.3)	2 (100)		
Most of the time.	7 (9.72)	12 (12.6)	13 (18.85)	6 (6.4)	2 (11.1)	0 (0)		
Total	72 (100)	95 (100)	69 (100)	94 (100)	18 (100)	2 (100)		
Use custom mixing tools.								
Never.	15 (20.8)	12 (12.6)	10 (14.5)	13 (13.8)	2 (11.1)	0 (0)	11.449	0.324
Sometimes.	35 (48.6)	39 (41.1)	23 (33.3)	39 (41.5)	7 (38.9)	2 (100)		
Most of the time.	22 (30.6)	44 (46.3)	36 (52.2)	42 (44.7)	9 (50)	0 (0)		
Total	72 (100)	95 (100)	69 (100)	94 (100)	18 (100)	2 (100)		
Clean the spray tools after finishing the spraying process.								
Never.	9 12.5)	7 (7.4)	4 (5.8)	8 (8.5)	0 (0)	1 (50)	18.330	0.050
Sometimes.	31 (43.1)	31 (32.6)	18 (26.1)	30 (31.9)	10 (55.6)	0 (0)		
Most of the time.	32 (44.4)	57 (60)	47 (68.1)	56 (59.6)	8 (44.4)	1 (50)		
Total	72 (100)	95 (100)	69 (100)	94 (100)	18 (100)	2 (100)		

Hand washing after using pesticides.								
Never.	11 (15.3)	4 (4.2)	4 (5.8)	8 (8.5)	1 (5.6)	0 (0)	26.049	0.004
Sometimes.	19 (26.4)	26 (27.4)	14 (20.3)	10 (10.6)	6 (33.3)	2 (100)		
Most of the time.	42 (58.3)	65 (68.4)	51 (73.9)	76 (80.9)	11 (61.1)	0 (0)		
Total	72 (100)	95 (100)	69 (100)	94 (100)	18 (100)	2 (100)		
Change clothes after spraying.								
Never.	6 (8.3)	7 (7.4)	6 (8.7)	7 (7.45)	1 (5.6)	2 (100)	33.008	0.000
Sometimes.	26 (36.1)	31 (32.6)	16 (23.2)	16 (17)	6 (33.3)	0 (0)		
Most of the time.	40 (55.6)	57 (60)	47 (68.1)	71 (75.55)	11 (61.1)	0 (0)		
Total	72 (100)	95 (100)	69 (100)	94 (100)	18 (100)	2 (100)		
Bathing with soap and water after finishing the spraying process.								
Never.	14 (19.4)	22 (23.2)	16 (23.2)	26 (27.65)	5 (27.8)	1 (50)	5.152	0.881
Sometimes.	19 (26.4)	31 (32.6)	21 (30.4)	26 (27.65)	6 (33.3)	1 (50)		
Most of the time.	39 (54.2)	42 (44.2)	32 (46.4)	42 (44.7)	7 (38.9)	0 (0)		
Total	72 (100)	95 (100)	69 (100)	94 (100)	18 (100)	2 (100)		
Smoking while handling and using pesticides.								
Never.	44 (61.1)	60 (63.2)	44 (63.8)	72 (76.6)	11 (61.1)	2 (100)	7.695	0.659
Sometimes.	22 (30.6)	27 (28.4)	19 (27.5)	18 (19.1)	6 (33.3)	0 (0)		
Most of the time.	6 (8.3)	8 (8.4)	6 (8.7)	4 (4.3)	1 (5.6)	0 (0)		
Total	72 (100)	95 (100)	69 (100)	9476 (100)	18 (100)	2 (100)		
Eat or drink while handling and using pesticides.								
Never.	52 (72.3)	67 (70.53)	51 (73.91)	76 (80.8)	13 (72.2)	1 (50)	9.512	0.484
Sometimes.	15 (20.8)	18 (18.95)	11 (15.94)	15 (16)	5 (27.8)	1 (50)		
Most of the time.	5 (6.9)	10 (10.52)	7 (10.15)	3 (3.2)	0 (0)	0 (0)		
Total	72 (100)	95 (100)	69 (100)	94 (100)	18 (100)	2 (100)		

Allow entry to farm animals immediately after spraying.								
Never.	44 (61.1)	62 (65.3)	45 (65.2)	70 (74.4)	11 (61.1)	2 (100)	13.061	0.220
Sometimes.	23 (31.95)	21 (22.1)	18 (26.1)	23 (24.5)	5 (27.8)	0 (0)		
Most of the time.	5 (6.95)	12 (12.6)	6 (8.7)	1 (1.1)	2 (11.1)	0 (0)		
Total	72 (100)	95 (100)	69 (100)	94 (100)	18 (100)	2 (100)		
Adhere to the pre-harvest interval period of the pesticide.								
Never.	12 (16.6)	16 (16.84)	11 (15.9)	11 (11.7)	0 (0)	0 (0)	13.348	0.205
Sometimes.	30 (41.7)	25 (26.32)	22 (31.9)	23 (24.5)	6 (33.3)	1 (50)		
Most of the time.	30 (41.7)	54 (56.84)	36 (52.2)	60 (63.8)	12 (66.7)	1 (50)		
Total	72 (100)	95 (100)	69 (100)	94 (100)	18 (100)	2 (100)		

***P≤0.05: Significant, P>0.05: Not significant; n: number of the subjects; %: Percentage.**

B.4.3 The third hypothesis (H03)

H03: hypothesis stated that there is no significant impact of the farmer's age on the farmer's knowledge of the safe use of agricultural pesticides & safety measures implementation at the level of $\alpha \leq 0.05$.

Table (36) showed that there were no significant differences were found between farmer's age and {using pesticides in agricultural land; taking into account the appropriate weather conditions when using pesticides; knowing the amount of used pesticides; adhere to the recommended dose; reading the information on the pesticide card & following the written instructions; spraying two or more mixed pesticides; and placing a warning sign on the field sprayed with pesticides or where the pesticides are} Therefore, and due to the fact that $p > 0.05$, the null hypothesis failed to be rejected, and the analysis found no significant difference, therefore the H0 is accepted.

Table (36): Relationship between farmer's age and farmer's knowledge of safe use of agricultural pesticides

Item	Age group					Chi-Square	P-value
	Less than 20. n (%)	From (21 - 30). n (%)	From (31 - 40). n (%)	From (41 - 60). n (%)	More than 61. n (%)		
Do you use pesticides in agricultural land?							
Yes	25 (100)	60 (93.75)	101 (94.4)	122 (97.6)	28 (96.6)	3.462	0.484
No	0 (0)	4 (6.25)	6 (5.6)	3 (2.4)	1 (3.4)		
Total	25 (100)	64 (100)	107 (100)	125 (100)	29 (100)		
Do you take into account the appropriate weather conditions when using pesticides?							
Yes	23 (92)	53 (82.8)	97 (90.7)	111 (88.8)	25 (86.2)	2.921	0.571
No	2 (8)	11 (17.2)	10 (9.3)	14 (11.2)	4 (13.8)		
Total	25 (100)	64 (100)	107 (100)	125 (100)	29 (100)		
Do you know the amount of pesticides you use?							
Yes	15 (60)	37 (57.8)	71 (66.4)	75 (60)	16 (55.2)	2.040	0.728
No	10 (40)	27 (42.2)	36 (33.6)	50 (40)	13 (44.8)		
Total	25 (100)	64 (100)	107 (100)	125 (100)	29 (100)		
Do you adhere to the recommended dose?							
Yes	23 (92)	60 (93.75)	97 (90.7)	113 (90.4)	28 (96.6)	1.687	0.793
No	2 (8)	4 (6.25)	10 (9.3)	12 (9.6)	1 (3.4)		
Total	25 (100)	64 (100)	107 (100)	125 (100)	29 (100)		
Do you read the information on the pesticide card and follow the written instructions?							
Yes	22 (88)	54 (84.4)	92 (86)	100 (80)	23 (79.3)	2.290	0.683
No	3 (12)	10 (15.6)	15 (14)	25 (20)	6 (20.7)		
Total	25 (100)	64 (100)	107 (100)	125 (100)	29 (100)		
Do you spray two or more mixed pesticides?							
Yes	23 (92)	61 (95.3)	99 (92.5)	107 (85.6)	26 (89.7)	5.681	0.224
No	2 (8)	3 (4.7)	8 (7.5)	18 (14.4)	3 (10.3)		
Total	25 (100)	64 (100)	107 (100)	125 (100)	29 (100)		
Are you placing a warning sign on the field sprayed with pesticides or where the pesticides are?							
Yes	16 (64)	26 (40.6)	52 (48.6)	46 (36.8)	15 (51.7)	8.581	0.072
No	9 (36)	38 (59.4)	55 (51.4)	79 (63.2)	14 (48.3)		
Total	25 (100)	64 (100)	107 (100)	125 (100)	29 (100)		

***P≤0.05: Significant, P>0.05: Not significant; n: number of the subjects; %: Percentage.**

Table (37) showed that there were no significant differences were found between farmer's age and {reading the pesticide label before use;

calculate the required amount for spraying; confirm the expiration date; examination of insect and disease samples before using the pesticide; use personal protective equipment when dealing with pesticides and chemicals; check spray equipment before using pesticides; use custom mixing tools; clean the spray tools after finishing the spraying process; hand washing after using pesticides; change clothes after spraying; bathing with soap and water after finishing the spraying process; smoking while handling and using pesticides; eat or drink while handling and using pesticides; allow entry to farm animals immediately after spraying; and adhere to the pre-harvest interval period of the pesticide} Therefore, and due to the fact that $p > 0.05$, the null hypothesis failed to be rejected, and the analysis found no significant difference, therefore the H0 is accepted.

While there were significant differences between farmer’s age and use hands to mix without protection, "P value was less than 0.05; Therefore, I reject the null hypothesis".

Table (37): Relationship between farmer's age and safety measures implementation

Item	Age group					Chi-Square	P-value
	Less than 20. n (%)	From (21 - 30). n (%)	From (31 - 40). n (%)	From (41 - 60). n (%)	More than 61. n (%)		
Precautions "safety measures" for using pesticides in agriculture land:							
Read the pesticide label before use.							
Never.	2 (8)	7 (10.9)	18 16.8)	18 (14.4)	2 (6.9)	4.930	0.765
Sometimes.	7(28)	26(40.6)	38 (35.5)	46 (36.8)	11(37.9)		
Most of the time.	16 (64)	31(48.4)	51 (47.7)	61 (48.8)	16(55.2)		
Total	25(100)	64(100)	107(100)	125(100)	29(100)		
Calculate the required amount for spraying.							
Never.	2 (8)	4 (6.3)	7 (6.54)	15 (12)	2 (6.9)	5.453	0.708
Sometimes.	8 (32)	17 (26.5)	38 (35.52)	44 (35.2)	10 (34.5)		
Most of the time.	15 (60)	43 (67.2)	62 (57.94)	66 (52.8)	17 (58.6)		
Total	25 (100)	64 (100)	107 (100)	125 (100)	29 (100)		
Confirm the expiration date.							
Never.	3 (12)	7 (10.9)	15 (14)	12 (9.6)	3 (10.3)	8.319	0.403
Sometimes.	4 (16)	19 (29.7)	37(34.6)	49(39.2)	7(24.1)		
Most of the time.	18 (72)	38 (59.4)	55 (51.4)	64 (51.2)	19 (65.6)		
Total	25 (100)	64(100)	107 (100)	125 (100)	29(100)		
Examination of insect and disease samples before using the pesticide.							
Never.	5 (20)	17 (26.5)	31(29)	45 (36)	9 (31)	5.329	0.722
Sometimes.	12 (48)	30 (46.9)	46 (43)	52 (41.6)	10 (34.5)		
Most of the time.	8 (32)	17 (26.6)	30(28)	28 (22.4)	10 (34.5)		
Total	25 (100)	64 (100)	107 (100)	125 (100)	29 (100)		
Use personal protective equipment (special clothing, etc.) when dealing with pesticides and chemicals.							
Never.	3 (12)	10 (15.6)	21 (19.6)	15 (12)	4 (13.8)	8.011	0.432
Sometimes.	10 (40)	29 (45.3)	44 (41.1)	67 (53.6)	10 (34.5)		
Most of the time.	12 (48)	25 (39.1)	42 (39.3)	43 (34.4)	15 (51.7)		
Total	25 (100)	64 (100)	107 (100)	125 (100)	29 (100)		
Check spray equipment before using pesticides.							
Never.	1 (4)	11 (17.2)	17 (15.9)	17 (13.6)	4 (13.8)	9.170	0.328
Sometimes.	7 (28)	29 (45.3)	43 (40.2)	54 (43.2)	9 (31)		
Most of the time.	17 (68)	24 (37.5)	47 (43.9)	54 (43.2)	16 (55.2)		
Total	25 (100)	64 (100)	107 (100)	125 (100)	29 (100)		

Use hands to mix without protection.							
Never.	15 (60)	42 (65.6)	49 (45.8)	66 (52.8)	19 (65.5)	23.750	0.003
Sometimes.	6 (24)	17 (26.6)	39 (36.4)	53 (42.4)	4 (13.8)		
Most of the time.	4 (16)	5 (7.8)	19 (17.8)	6 (4.8)	6 (20.7)		
Total	25 (100)	64 (100)	107 (100)	125 (100)	29 (100)		
Use custom mixing tools.							
Never.	4 (16)	7 (10.95)	18 (16.8)	18 (14.4)	5 (17.25)	11.849	0.158
Sometimes.	6 (24)	26 (40.62)	40 (37.4)	64 (51.2)	9 (31)		
Most of the time.	15 (60)	31 (48.43)	49 (45.8)	43 (34.4)	15 (51.75)		
Total	25 (100)	64 (100)	107 (100)	125 (100)	29 (100)		
Clean the spray tools after finishing the spraying process.							
Never.	2 (8)	6 (9.4)	6 (5.6)	14 (11.2)	1 (3.4)	10.135	0.256
Sometimes.	4 (16)	21 (32.8)	44 (41.1)	43 (34.4)	8 (27.6)		
Most of the time.	19(76)	37 (57.8)	57 (53.3)	68 (54.4)	20 (69)		
Total	25 (100)	64 (100)	107 (100)	125 (100)	29 (100)		
Hand washing after using pesticides.							
Never.	1 (4)	7 (10.9)	9 (8.4)	9 (7.2)	2 (6.9)	9.011	0.341
Sometimes.	5 (20)	13 (20.3)	26 (24.3)	32 (25.6)	1 (3.4)		
Most of the time.	19 (76)	44 (68.8)	72 (67.3)	84 (67.2)	26 (89.7)		
Total	25 (100)	64 (100)	107 (100)	125 (100)	29 (100)		
Change clothes after spraying.							
Never.	2 (8)	6 (9.4)	9 (8.4)	9 (7.2)	3 (10.3)	4.276	0.831
Sometimes.	7 (28)	15 (23.4)	30 (28)	39 (31.2)	4 (13.8)		
Most of the time.	16 (64)	43 (67.2)	68 (63.6)	77 (61.6)	22 (75.9)		
Total	25 (100)	64 (100)	107 (100)	125 (100)	29 (100)		
Bathing with soap and water after finishing the spraying process.							
Never.	4 (16)	17 (26.6)	25 (23.4)	31 (24.8)	7 (24.1)	6.595	0.581
Sometimes.	7 (28)	21 (32.8)	32 (29.9)	40 (32)	4 (13.8)		
Most of the time.	14 (56)	26 (40.6)	50 (46.7)	54 (43.2)	18 (62.1)		
Total	25 (100)	64 (100)	107 (100)	125 (100)	29 (100)		
Smoking while handling and using pesticides.							
Never.	21 (84)	47 (73.4)	75 (70.1)	71 (56.8)	19 (65.5)	13.175	0.106
Sometimes.	4 (16)	11 (17.2)	25 (23.4)	44 (35.2)	8 (27.6)		
Most of the time.	0 (0)	6 (9.4)	7 (6.5)	10 (8)	2 (6.9)		
Total	25 (100)	64 (100)	107 (100)	125 (100)	29 (100)		
Eat or drink while handling and using pesticides.							

Never.	21 (84)	50 (78.1)	77 (72)	91 (72.8)	21 (72.4)	5.603	0.692
Sometimes.	2 (8)	10 (15.6)	23 (21.5)	26 (20.8)	4 (13.8)		
Most of the time.	2 (8)	4 (6.3)	7 (6.5)	8 (6.4)	4 (13.8)		
Total	25 (100)	64 (100)	107 (100)	125 (100)	29 (100)		
Allow entry to farm animals immediately after spraying.							
Never.	16 (64)	45 (70.3)	71 (66.4)	83 (66.4)	19 (65.55)	4.893	0.769
Sometimes.	9 (36)	13 (20.3)	27 (25.2)	34 (27.2)	7 (24.13)		
Most of the time.	0 (0)	6 (9.4)	9 (8.4)	8 (6.4)	3 (10.32)		
Total	25 (100)	64 (100)	107 (100)	125 (100)	29 (100)		
Adhere to the pre-harvest interval period of the pesticide.							
Never.	2 (8)	10 (15.6)	21 (19.63)	13 (10.4)	4(13.8)	10.263	0.247
Sometimes.	5 (20)	16(25)	33 (30.83)	46 (36.8)	7(24.1)		
Most of the time.	18 (72)	38 (59.4)	53 (49.54)	66 (52.8)	18 (62.1)		
Total	25 (100)	64 (100)	107 (100)	125 (100)	29 (100)		

*P≤0.05: Significant, P>0.05: Not significant; **n:** number of the subjects; **%:** Percentage.

B.4.4 The fourth hypothesis (H04)

H04: hypothesis stated that there is no significant impact of the gender differences on the farmer's knowledge on the safe use of agricultural pesticides and safety measures implementation at the level of $\alpha \leq 0.05$.

Table (38) showed that there were no significant differences were found between gender and {using pesticides in agricultural land; taking into account the appropriate weather conditions when using pesticides; knowing the amount of used pesticides; adhere to the recommended dose; reading the information on the pesticide card & following the written instructions; and spraying two or more mixed pesticides} Therefore, and due to the fact that $p > 0.05$, the null hypothesis failed to be rejected, and the analysis found no significant difference, therefore the H0 is accepted.

Also, there were significant differences between gender and placing a warning sign on the field sprayed with pesticides or where the pesticides are, "P value was less than 0.05; Therefore, I reject the null hypothesis".

Table (38): Relationship between gender differences and farmer's knowledge of safe use of agricultural pesticides

Item	Gender		Chi-Square	P-value
	Male. n (%)	Female. n (%)		
Do you use pesticides in agricultural land?				
Yes	266 (95.3)	70 (98.6)	1.558	0.212
No	13 (4.7)	1 (1.4)		
Total	279 (100)	71 (100)		
Do you take into account the appropriate weather conditions when using pesticides?				
Yes	249 (89.2)	60 (84.5)	1.230	0.267
No	30 (10.8)	11 (15.5)		
Total	279 (100)	71 (100)		
Do you know the amount of pesticides you use?				
Yes	176 (63.1)	38 (53.5)	2.178	0.140
No	103 (36.9)	33 (46.5)		
Total	279 (100)	71 (100)		
Do you adhere to the recommended dose?				
Yes	253 (90.7)	68 (95.8)	1.932	0.165
No	26 (9.3)	3 (4.2)		
Total	279 (100)	71 (100)		
Do you read the information on the pesticide card and follow the written instructions?				
Yes	234 (83.9)	57 (80.3)	0.520	0.471
No	45 (16.1)	14 (19.7)		
Total	279 (100)	71 (100)		
Do you spray two or more mixed pesticides?				
Yes	252 (90.3)	64 (90.1)	0.002	0.963
No	27 (9.7)	7 (9.9)		
Total	279 (100)	71 (100)		
Are you placing a warning sign on the field sprayed with pesticides or where the pesticides are?				
Yes	114 (40.9)	41 (57.7)	6.541	0.011
No	165 (59.1)	30 (42.3)		
Total	279 (100)	71 (100)		

***P≤0.05: Significant, P>0.05: Not significant; n: number of the subjects; %: Percentage.**

Furthermore Table (39) shows that there were no significant differences were found between gender differences and {reading the pesticide label before use; calculate the required amount for spraying; confirm the expiration date; examination of insect and disease samples before using the pesticide; check spray equipment before using pesticides; use custom mixing tools; clean the spray tools after finishing the spraying process; hand washing after using pesticides; change clothes after spraying; bathing with soap and water after finishing the spraying process; smoking while handling and using pesticides; eat or drink while handling and using pesticides; allow entry to farm animals immediately after spraying; and adhere to the pre-harvest interval period of the pesticide} Therefore, and due to the fact that p> 0.05, the null hypothesis failed to be rejected, and the analysis found no significant difference, therefore the H0 is accepted.

Also, there were statistically significant differences between gender differences and {use personal protective equipment when dealing with pesticides and chemicals; and use hands to mix without protection} "P value was less than 0.05; Therefore, I reject the null hypothesis".

Table (39): Relationship between gender differences and safety measures implementation

Item	Gender		Chi-Square	P-value
	Male. n (%)	Female. n (%)		
Precautions "safety measures" for using pesticides in agriculture land:				
Read the pesticide label before use.				
Never.	38 (13.6)	9 (12.7)	0.162	0.922
Sometimes.	103 (36.9)	25 (35.2)		
Most of the time.	138 (49.5)	37 (52.1)		
Total	279 (100)	71 (100)		
Calculate the required amount for spraying.				
Never.	26 (9.3)	4 (5.63)	2.003	0.367
Sometimes.	89 (31.9)	28 (39.44)		
Most of the time.	164 (58.8)	39 (54.93)		
Total	279 (100)	71 (100)		
Confirm the expiration date.				
Never.	28 (10)	12 (16.9)	2.950	0.229
Sometimes.	92 (33)	24 (33.8)		
Most of the time.	159 (57)	35 (49.3)		
Total	279 (100)	71 (100)		
Examination of insect and disease samples before using the pesticide.				
Never.	90 (32.25)	17 (23.9)	2.430	0.297
Sometimes.	119 (42.65)	31 (43.7)		
Most of the time.	70 (25.1)	23 (32.4)		
Total	279 (100)	71 (100)		
Use personal protective equipment (special clothing, etc.) when dealing with pesticides and chemicals.				
Never.	34 (12.2)	19 (26.8)	10.705	0.005
Sometimes.	136 (48.7)	24 (33.8)		
Most of the time.	109 (39.1)	28 (39.4)		
Total	279 (100)	71 (100)		
Check spray equipment before using pesticides.				
Never.	38 (13.6)	12 (16.9)	4.635	0.099
Sometimes.	107 (38.4)	35 (49.3)		
Most of the time.	134 (48)	24 (33.8)		
Total	279 (100)	71 (100)		
Use hands to mix without protection.				
Never.	155 (55.6)	36 (50.7)	6.112	0.047
Sometimes.	98 (35.1)	21 (29.6)		
Most of the time.	26 (9.3)	14 (19.7)		
Total	279 (100)	71 (100)		
Use custom mixing tools.				
Never.	41 (14.7)	11 (15.5)	0.429	0.807
Sometimes.	118 (42.3)	27 (38)		
Most of the time.	120 (43)	33 (46.5)		
Total	279 (100)	71 (100)		

Clean the spray tools after finishing the spraying process.				
Never.	22 (7.9)	7 (9.9)	1.657	0.437
Sometimes.	92 (33)	28 (39.4)		
Most of the time.	165 (59.1)	36 (50.7)		
Total	279 (100)	71 (100)		
Hand washing after using pesticides.				
Never.	23 (8.24)	5 (7)	0.630	0.730
Sometimes.	59 (21.15)	18 (25.4)		
Most of the time.	197 (70.61)	48 (67.6)		
Total	279 (100)	71 (100)		
Change clothes after spraying.				
Never.	24 (8.6)	5 (7)	0.380	0.827
Sometimes.	74 (26.5)	21 (29.6)		
Most of the time.	181 (64.9)	45 (63.4)		
Total	279 (100)	71 (100)		
Bathing with soap and water after finishing the spraying process.				
Never.	69 (24.7)	15 (21.13)	5.044	0.080
Sometimes.	89 (31.9)	15 (21.13)		
Most of the time.	121 (43.4)	41 (57.74)		
Total	279 (100)	71 (100)		
Smoking while handling and using pesticides.				
Never.	182 (65.2)	51 (71.8)	5.476	0.065
Sometimes.	80 (28.7)	12 (16.9)		
Most of the time.	17 (6.1)	8 (11.3)		
Total	279 (100)	71 (100)		
Eat or drink while handling and using pesticides.				
Never.	210 (75.3)	50 (70.4)	2.304	0.316
Sometimes.	52 (18.6)	13 (18.3)		
Most of the time.	17 (6.1)	8 (11.3)		
Total	279 (100)	71 (100)		
Allow entry to farm animals immediately after spraying.				
Never.	189 (67.7)	45 (63.4)	1.933	0.380
Sometimes.	72 (25.8)	18 (25.3)		
Most of the time.	18 (6.5)	8 (11.3)		
Total	279 (100)	71 (100)		
Adhere to the pre-harvest interval period of the pesticide.				
Never.	35 (12.5)	15 (21.13)	4.198	0.123
Sometimes.	90 (32.3)	17 (23.94)		
Most of the time.	154 (55.2)	39 (54.93)		
Total	279 (100)	71 (100)		

***P≤0.05: Significant, P>0.05: Not significant; n: number of the subjects; %: Percentage.**

B.4.5 The fifth hypothesis (H05)

H05: hypothesis stated that there is no significant impact of the pesticide use on the farmer's knowledge on the safe use of agricultural pesticides and safety measures implementation at the level of $\alpha \leq 0.05$.

Table (40) showed that there were no significant differences were found between pesticide use and {taking into account the appropriate weather conditions when using pesticides; knowing the amount of used pesticides; adhere to the recommended dose; reading the information on the pesticide card & following the written instructions; spraying two or more mixed pesticides; and placing a warning sign on the field sprayed with pesticides or where the pesticides are} Therefore, and due to the fact that $p > 0.05$, the null hypothesis failed to be rejected, and the analysis found no significant difference, therefore the H0 is accepted.

Table (40): Relationship between pesticide use and farmer's knowledge of safe use of agricultural pesticides

Item	Do you use pesticides in agricultural land?		Chi-Square	P-value
	Yes. n (%)	No. n (%)		
Do you take into account the appropriate weather conditions when using pesticides?				
Yes	296 (88.1)	13 (92.9)	0.295	0.587
No	40 (11.9)	1 (7.1)		
Total	336 (100)	14 (100)		
Do you know the amount of pesticides you use?				
Yes	205 (61)	9 (64.3)	0.061	0.806
No	131 (39)	5 (35.7)		
Total	336 (100)	14 (100)		
Do you adhere to the recommended dose?				
Yes	308 (91.7)	13 (92.9)	0.025	0.874
No	28 (8.3)	1 (7.1)		
Total	336 (100)	14 (100)		
Do you read the information on the pesticide card and follow the written				

instructions?				
Yes	279 (83)	12 (85.7)	0.069	0.793
No	57 (17)	2 (14.3)		
Total	336 (100)	14 (100)		
Do you spray two or more mixed pesticides?				
Yes	302 (89.9)	14 (100)	1.569	0.210
No	34 (10.1)	0 (0)		
Total	336 (100)	14 (100)		
Are you placing a warning sign on the field sprayed with pesticides or where the pesticides are?				
Yes	150 (44.6)	5 (35.7)	0.434	0.510
No	186 (55.4)	9 (64.3)		
Total	336 (100)	14 (100)		

***P≤0.05: Significant, P>0.05: Not significant; n: number of the subjects; %: Percentage.**

Moreover Table (41) shows that there were no significant differences between were found pesticide use and {reading the pesticide label before use; calculate the required amount for spraying; confirm the expiration date; examination of insect and disease samples before using the pesticide; use personal protective equipment when dealing with pesticides and chemicals; check spray equipment before using pesticides; use hands to mix without protection; use custom mixing tools; clean the spray tools after finishing the spraying process; hand washing after using pesticides; change clothes after spraying; bathing with soap and water after finishing the spraying process; smoking while handling and using pesticides; eat or drink while handling and using pesticides; allow entry to farm animals immediately after spraying; and adhere to the pre-harvest interval period of the pesticide} Therefore, and due to the fact that p> 0.05, the null hypothesis failed to be rejected, and the analysis found no significant difference, therefore the H0 is accepted.

Table (41): Relationship between pesticide use and safety measures implementation

Item	Do you use pesticides in agricultural land?		Chi-Square	P-value
	Yes. n (%)	No. n (%)		
Precautions "safety measures" for using pesticides in agriculture land:				
Read the pesticide label before use.				
Never.	47 (14)	0 (0)	2.265	0.322
Sometimes.	122 (36.3)	6 (42.9)		
Most of the time.	167 (49.7)	8 (57.1)		
Total	336 (100)	14 (100)		
Calculate the required amount for spraying.				
Never.	30 (8.93)	0 (0)	1.806	0.405
Sometimes.	113 (33.63)	4 (28.6)		
Most of the time.	193 (57.44)	10 (71.4)		
Total	336 (100)	14 (100)		
Confirm the expiration date.				
Never.	39 (11.6)	1 (7.1)	3.208	0.201
Sometimes.	114 (33.9)	2 (14.3)		
Most of the time.	183 (54.5)	11 (78.6)		
Total	336 (100)	14 (100)		
Examination of insect and disease samples before using the pesticide.				
Never.	104 (31)	3 (21.4)	0.594	0.743
Sometimes.	143 (42.55)	7 (50)		
Most of the time.	89 (26.45)	4 (28.6)		
Total	336 (100)	14 (100)		
Use personal protective equipment (special clothing, etc.) when dealing with pesticides and chemicals.				
Never.	52 (15.5)	1 (7.1)	0.726	0.695
Sometimes.	153 (45.5)	7 (50)		
Most of the time.	131 (39)	6 (42.9)		
Total	336 (100)	14 (100)		
Check spray equipment before using pesticides.				
Never.	49 (14.6)	1 (7.1)	0.616	0.735
Sometimes.	136 (40.5)	6 (42.9)		
Most of the time.	151 (44.9)	7 (50)		
Total	336 (100)	14 (100)		
Use hands to mix without protection.				
Never.	186 (55.4)	5 (35.7)	2.152	0.341
Sometimes.	112 (33.3)	7 (50)		
Most of the time.	38 (11.3)	2 (14.3)		
Total	336 (100)	14 (100)		
Use custom mixing tools.				
Never.	51 (15.18)	1 (7.14)	1.301	0.522
Sometimes.	140 (41.67)	5 (35.72)		

Most of the time.	145 (43.15)	8 (57.14)		
Total	336 (100)	14 (100)		
Clean the spray tools after finishing the spraying process.				
Never.	28 (8.3)	1 (7.1)	0.476	0.788
Sometimes.	114 (33.9)	6 (42.9)		
Most of the time.	194 (57.7)	7 (50)		
Total	336 (100)	14 (100)		
Hand washing after using pesticides.				
Never.	27 (8)	1 (7.14)	0.020	0.990
Sometimes.	74 (22)	3 (21.43)		
Most of the time.	235 (70)	10 (71.43)		
Total	336 (100)	14 (100)		
Change clothes after spraying.				
Never.	28 (8.3)	1 (7.1)	0.034	0.983
Sometimes.	91 (27.1)	4 (28.6)		
Most of the time.	217 (64.6)	9 (64.3)		
Total	336 (100)	14 (100)		
Bathing with soap and water after finishing the spraying process.				
Never.	82 (24.4)	2 (14.3)	5.254	0.072
Sometimes.	96 (28.6)	8 (57.1)		
Most of the time.	158 (47)	4 (28.6)		
Total	336 (100)	14 (100)		
Smoking while handling and using pesticides.				
Never.	224 (66.7)	9 (64.3)	1.184	0.553
Sometimes.	89 (26.5)	3 (21.4)		
Most of the time.	23 (6.8)	2 (14.3)		
Total	336 (100)	14 (100)		
Eat or drink while handling and using pesticides.				
Never.	251 (74.7)	9 (64.3)	1.302	0.522
Sometimes.	62 (18.5)	3 (21.4)		
Most of the time.	23 (6.8)	2 (14.3)		
Total	336 (100)	14 (100)		
Allow entry to farm animals immediately after spraying.				
Never.	226 (67.3)	8 (57.1)	1.175	0.556
Sometimes.	86 (25.6)	4 (28.6)		
Most of the time.	24 (7.1)	2 (14.3)		
Total	336 (100)	14 (100)		
Adhere to the pre-harvest interval period of the pesticide.				
Never.	47 (14)	3 (21.4)	1.046	0.593
Sometimes.	102 (30.35)	5 (35.7)		
Most of the time.	187 (55.65)	6 (42.9)		
Total	336 (100)	14 (100)		

***P≤0.05: Significant, P>0.05: Not significant; n: number of the subjects; %: Percentage.**

B.4.6 The sixth hypothesis (H06)

H06: hypothesis stated that there is no significant impact of the training provided by governmental organization on the farmer's knowledge on the safe use of agricultural pesticides and safety measures implementation at the level of $\alpha \leq 0.05$.

Table (42) clearly indicated no significant differences were found between training provided by governmental organization and (using pesticides in agricultural land; taking into account the appropriate weather conditions when using pesticides; knowing the amount of used pesticides; adhere to the recommended dose; reading the information on the pesticide card & following the written instructions; and spraying two or more mixed pesticides) Therefore, and due to the fact that $p > 0.05$, the null hypothesis failed to be rejected, and the analysis found no significant difference, therefore the H0 is accepted.

As well as there were significant differences between training provided by governmental organization and (placing a warning sign on the field sprayed with pesticides or where the pesticides are), "P value was less than 0.05; Therefore, I reject the null hypothesis".

Table (42): Relationship between training provided by governmental organization and farmer's knowledge of safe use of agricultural pesticides

Item	Have you been trained (by governmental organization) for safety measures while using pesticides?		Chi-Square	P-value
	Yes. n (%)	No. n (%)		
Do you use pesticides in agricultural land?				
Yes	61 (96.8)	275 (95.8)	0.136	0.712
No	2 (3.2)	12 (4.2)		
Total	63 (100)	287 (100)		
Do you take into account the appropriate weather conditions when using pesticides?				
Yes	56 (88.9)	253 (88.2)	0.027	0.869
No	7 (11.1)	34 (11.8)		
Total	63 (100)	287 (100)		
Do you know the amount of pesticides you use?				
Yes	40 (63.5)	174 (60.6)	0.178	0.673
No	23 (36.5)	113 (39.4)		
Total	63 (100)	287 (100)		
Do you adhere to the recommended dose?				
Yes	60 (95.2)	261 (90.9)	1.255	0.263
No	3 (4.8)	26 (9.1)		
Total	63 (100)	287 (100)		
Do you read the information on the pesticide card and follow the written instructions?				
Yes	57 (90.5)	234 (81.5)	2.948	0.086
No	6 (9.5)	53 (18.5)		
Total	63 (100)	287 (100)		
Do you spray two or more mixed pesticides?				
Yes	56 (88.9)	260 (90.6)	0.171	0.679
No	7 (11.1)	27 (9.4)		
Total	63 (100)	287 (100)		
Are you placing a warning sign on the field sprayed with pesticides or where the pesticides are?				
Yes	36 (57.1)	119 (41.5)	5.147	0.023
No	27 (42.9)	168 (58.5)		
Total	63 (100)	287 (100)		

***P≤0.05: Significant, P>0.05: Not significant; n: number of the subjects; %: Percentage.**

On the other hand, Table (43) showed that there were no significant differences were found between training provided by governmental

organization and (reading the pesticide label before use; calculate the required amount for spraying; confirm the expiration date; examination of insect and disease samples before using the pesticide; check spray equipment before using pesticides; use custom mixing tools; clean the spray tools after finishing the spraying process; hand washing after using pesticides; change clothes after spraying; bathing with soap and water after finishing the spraying process; smoking while handling and using pesticides; eat or drink while handling and using pesticides; allow entry to farm animals immediately after spraying; and adhere to the pre-harvest interval period of the pesticide) Therefore, and due to the fact that $p > 0.05$, the null hypothesis failed to be rejected, and the analysis found no significant difference, therefore the H0 is accepted.

While there were statistically significant differences between training provided by governmental organization and (use personal protective equipment when dealing with pesticides and chemicals; and use hands to mix without protection) "P value was less than 0.05; Therefore, I reject the null hypothesis".

Table (43): Relationship between training provided by governmental organization and safety measures implementation

Item	Have you been trained (by governmental organization) for safety measures while using pesticides?		Chi-Square	P-value
	Yes. n (%)	No. n (%)		
Precautions "safety measures" for using pesticides in agriculture land:				
Read the pesticide label before use.				
Never.	6 (9.5)	41 (14.3)	4.395	0.111
Sometimes.	18 (28.6)	110 (38.3)		
Most of the time.	39 (61.9)	136 (47.4)		
Total	63 (100)	287 (100)		
Calculate the required amount for spraying.				
Never.	3 (4.8)	27 (9.4)	4.641	0.098
Sometimes.	16 (25.4)	101 (35.2)		
Most of the time.	44 (69.8)	159 (55.4)		
Total	63 (100)	287 (100)		
Confirm the expiration date.				
Never.	6 (9.5)	34 (11.85)	2.926	0.232
Sometimes.	16 (25.4)	100 (34.84)		
Most of the time.	41 (65.1)	153 (53.31)		
Total	63 (100)	287 (100)		
Examination of insect and disease samples before using the pesticide.				
Never.	19 (30.2)	88 (30.6)	2.049	0.359
Sometimes.	23 (36.5)	127 (44.3)		
Most of the time.	21 (33.3)	72 (25.1)		
Total	63 (100)	287 (100)		
Use personal protective equipment (special clothing, etc.) when dealing with pesticides and chemicals.				
Never.	10 (15.85)	43 (15)	8.408	0.015
Sometimes.	19 (30.15)	141 (49.1)		
Most of the time.	34 (54)	103 (35.9)		
Total	63 (100)	287 (100)		
Check spray equipment before using pesticides.				
Never.	8 (12.7)	42 (14.6)	1.632	0.442
Sometimes.	22 (34.9)	120 (41.8)		
Most of the time.	33 (52.4)	125 (43.6)		
Total	63 (100)	287 (100)		
Use hands to mix without protection.				
Never.	43 (68.3)	148 (51.6)	7.796	0.020
Sometimes.	12 (19)	107 (37.3)		
Most of the time.	8 (12.7)	32 (11.1)		
Total	63 (100)	287 (100)		
Use custom mixing tools.				
Never.	13 (20.6)	39 (13.6)	4.612	0.100
Sometimes.	19 (30.2)	126 (43.9)		
Most of the time.	31 (49.2)	122 (42.5)		

Total	63 (100)	287 (100)		
Clean the spray tools after finishing the spraying process.				
Never.	3 (4.75)	26 (9.1)	3.914	0.141
Sometimes.	17 (27)	103 (35.8)		
Most of the time.	43 (68.25)	158 (55.1)		
Total	63 (100)	287 (100)		
Hand washing after using pesticides.				
Never.	4 (6.3)	24 (8.4)	1.402	0.496
Sometimes.	11 (17.5)	66 (23)		
Most of the time.	48 (76.2)	197 (68.6)		
Total	63 (100)	287 (100)		
Change clothes after spraying.				
Never.	7 (11.1)	22 (7.7)	2.926	0.232
Sometimes.	12 (19)	83 (28.9)		
Most of the time.	44 (69.9)	182 (63.4)		
Total	63 (100)	287 (100)		
Bathing with soap and water after finishing the spraying process.				
Never.	16 (25.4)	68 (23.7)	0.124	0.940
Sometimes.	19 (30.2)	85 (29.6)		
Most of the time.	28 (44.4)	134 (46.7)		
Total	63 (100)	287 (100)		
Smoking while handling and using pesticides.				
Never.	44 (69.84)	189 (65.9)	0.370	0.831
Sometimes.	15 (23.81)	77 (26.8)		
Most of the time.	4 (6.35)	21 (7.3)		
Total	63 (100)	287 (100)		
Eat or drink while handling and using pesticides.				
Never.	48 (76.2)	212 (73.9)	3.909	0.142
Sometimes.	14 (22.2)	51 (17.8)		
Most of the time.	1 (1.6)	24 (8.3)		
Total	63 (100)	287 (100)		
Allow entry to farm animals immediately after spraying.				
Never.	42 (66.7)	192 (66.9)	0.030	0.985
Sometimes.	16 (25.4)	74 (25.8)		
Most of the time.	5 (7.9)	21 (7.3)		
Total	63 (100)	287 (100)		
Adhere to the pre-harvest interval period of the pesticide.				
Never.	7 (11.1)	43 (15)	1.502	0.472
Sometimes.	17 (27)	90 (31.35)		
Most of the time.	39 (61.9)	154 (53.65)		
Total	63 (100)	287 (100)		

***P≤0.05: Significant, P>0.05: Not significant; n: number of the subjects; %: Percentage.**

B.4.7 The seventh hypothesis (H07)

H07: hypothesis stated that there is no significant impact of the training provided by nongovernmental organization on the farmer's knowledge on the safe use of agricultural pesticides and safety measures implementation at the level of $\alpha \leq 0.05$.

Table (44) clearly indicated no significant differences were found between training provided by nongovernmental organization and (using pesticides in agricultural land; taking into account the appropriate weather conditions when using pesticides; knowing the amount of used pesticides; adhere to the recommended dose; reading the information on the pesticide card & following the written instructions; spraying two or more mixed pesticides; and placing a warning sign on the field sprayed with pesticides or where the pesticides are) Therefore, and due to the fact that p> 0.05, the null hypothesis failed to be rejected, and the analysis found no significant difference, therefore the H0 is accepted.

Table (44): Relationship between training provided by nongovernmental organization and safe use of agricultural pesticides

Item	Have you been trained (by nongovernmental organization) for safety measures while using pesticides?		Chi-Square	P-value
	Yes. n (%)	No. n (%)		
Do you use pesticides in agricultural land?				
Yes	31 (96.9)	305 (95.9)	0.070	0.791
No	1 (3.1)	13 (4.1)		
Total	32 (100)	318 (100)		
Do you take into account the appropriate weather conditions when using pesticides?				
Yes	27 (84.4)	282 (88.7)	0.521	0.470
No	5 (15.6)	36 (11.3)		
Total	32 (100)	318 (100)		

Do you know the amount of pesticides you use?				
Yes	21 (65.6)	193 (60.7)	0.298	0.585
No	11 (34.4)	125 (39.3)		
Total	32 (100)	318 (100)		
Do you adhere to the recommended dose?				
Yes	30 (93.75)	291 (91.5)	0.192	0.661
No	2 (6.25)	27 (8.5)		
Total	32 (100)	318 (100)		
Do you read the information on the pesticide card and follow the written instructions?				
Yes	28 (87.5)	263 (82.7)	0.477	0.490
No	4 (12.5)	55 (17.3)		
Total	32 (100)	318 (100)		
Do you spray two or more mixed pesticides?				
Yes	29 (90.6)	287 (90.3)	0.005	0.946
No	3 (9.4)	31 (9.7)		
Total	32 (100)	318 (100)		
Are you placing a warning sign on the field sprayed with pesticides or where the pesticides are?				
Yes	14 (43.75)	141 (44.3)	0.004	0.949
No	18 (56.25)	177 (55.7)		
Total	32 (100)	318 (100)		

***P≤0.05: Significant, P>0.05: Not significant; n: number of the subjects; %: Percentage.**

Likewise Table (45) showed that there were no significant differences were found between training provided by nongovernmental organization and (read the pesticide label before use; calculate the required amount for spraying; confirm the expiration date; check spray equipment before using pesticides; use hands to mix without protection; use custom mixing tools; clean the spray tools after finishing the spraying process; hand washing after using pesticides; change clothes after spraying; bathing with soap and water after finishing the spraying process; smoking while handling and using pesticides; eat or drink while handling and using pesticides; and allow entry to farm animals immediately after spraying) Therefore, and due

to the fact that p> 0.05, the null hypothesis failed to be rejected, and the analysis found no significant difference, therefore the H0 is accepted.

Also, there were significant differences between training provided by nongovernmental organization and (examination of insect and disease samples before using the pesticide; use personal protective equipment when dealing with pesticides and chemicals; and adhere to the pre-harvest interval period of the pesticide) "P value was less than 0.05; Therefore, I reject the null hypothesis".

Table (45): Relationship between training provided by nongovernmental organization and safety measures implementation

Item	Have you been trained (by NGOs) for safety measures while using pesticides?		Chi-Square	P-value
	Yes. n (%)	No. n (%)		
Precautions "safety measures" for using pesticides in agriculture land:				
Read the pesticide label before use.				
Never.	4 (12.5)	43 (13.5)	3.822	0.148
Sometimes.	7 (21.9)	121 (38.1)		
Most of the time.	21 (65.6)	154 (48.4)		
Total	32 (100)	318 (100)		
Calculate the required amount for spraying.				
Never.	1 (3.1)	29 (9.12)	1.622	0.444
Sometimes.	10 (31.3)	107 (33.65)		
Most of the time.	21 (65.6)	182 (57.23)		
Total	32 (100)	318 (100)		
Confirm the expiration date.				
Never.	2 (6.25)	38 (11.9)	2.659	0.265
Sometimes.	8 (25)	108 (34)		
Most of the time.	22 (68.75)	172 (54.1)		
Total	32 (100)	318 (100)		
Examination of insect and disease samples before using the pesticide.				
Never.	4 (12.5)	103 (32.4)	6.513	0.039
Sometimes.	15 (46.9)	135 (42.5)		
Most of the time.	13 (40.6)	80 (25.1)		
Total	32 (100)	318 (100)		
Use personal protective equipment (special clothing, etc.) when dealing with				

pesticides and chemicals.				
Never.	2 (6.2)	51 (16)	6.513	0.039
Sometimes.	11 (34.4)	149 (46.9)		
Most of the time.	19 (59.4)	118 (37.1)		
Total	32 (100)	318 (100)		
Check spray equipment before using pesticides.				
Never.	3 (9.4)	47 (14.8)	1.174	0.556
Sometimes.	12 (37.5)	130 (40.9)		
Most of the time.	17 (53.1)	141 (44.3)		
Total	32 (100)	318 (100)		
Use hands to mix without protection.				
Never.	13 (40.6)	178 (56)	3.008	0.222
Sometimes.	15 (46.9)	104 (32.7)		
Most of the time.	4 (12.5)	36 (11.3)		
Total	32 (100)	318 (100)		
Use custom mixing tools.				
Never.	3 (9.4)	49 (15.4)	1.414	0.493
Sometimes.	16 (50)	129 (40.6)		
Most of the time.	13 (40.6)	140 (44)		
Total	32 (100)	318 (100)		
Clean the spray tools after finishing the spraying process.				
Never.	1 (3.1)	28 (8.8)	3.099	0.212
Sometimes.	15 (46.9)	105 (33)		
Most of the time.	16 (50)	185 (58.2)		
Total	32 (100)	318 (100)		
Hand washing after using pesticides.				
Never.	2 (6.2)	26 (8.2)	0.153	0.926
Sometimes.	7 (21.9)	70 (22)		
Most of the time.	23 (71.9)	222 (69.8)		
Total	32 (100)	318 (100)		
Change clothes after spraying.				
Never.	2 (6.25)	27 (8.5)	0.418	0.811
Sometimes.	10 (31.25)	85 (26.7)		
Most of the time.	20 (62.5)	206 (64.8)		
Total	32 (100)	318 (100)		
Bathing with soap and water after finishing the spraying process.				
Never.	9 (28.1)	75 (23.6)	0.516	0.773
Sometimes.	8 (25)	96 (30.2)		
Most of the time.	15 (46.9)	147 (46.2)		
Total	32 (100)	318 (100)		
Smoking while handling and using pesticides.				
Never.	20 (62.5)	213 (67)	0.379	0.827
Sometimes.	9 (28.1)	83 (26.1)		
Most of the time.	3 (9.4)	22 (6.9)		

Total	32 (100)	318 (100)		
Eat or drink while handling and using pesticides.				
Never.	25 (78.1)	235 (73.9)	0.274	0.872
Sometimes.	5 (15.6)	60 (18.9)		
Most of the time.	2 (6.3)	23 (7.2)		
Total	32 (100)	318 (100)		
Allow entry to farm animals immediately after spraying.				
Never.	25 (78.1)	209 (65.72)	2.129	0.345
Sometimes.	5 (15.6)	85 (26.73)		
Most of the time.	2 (6.3)	24 (7.55)		
Total	32 (100)	318 (100)		
Adhere to the pre-harvest interval period of the pesticide.				
Never.	9 (28.1)	41 (12.9)	8.599	0.014
Sometimes.	4 (12.5)	103 (32.4)		
Most of the time.	19 (59.4)	174 (54.7)		
Total	32 (100)	318 (100)		

***P≤0.05: Significant, P>0.05: Not significant; n: number of the subjects; %: Percentage.**

Chapter Five

Conclusion and Recommendations

5.1 Conclusion

A descriptive study was conducted, using a questionnaire tool to assess the agricultural pesticide knowledge and apply safety measures among farmers in Tulkarm governorate. The study sample consisted of 350 participants living in four different localities in the Tulkarm governorate and working in agriculture field or having agricultural land. The response rate of the participants was 100%. The study results might help to improve the status of farmers, by giving alert or warning for the current situation of pesticide usage in Palestine.

The study findings revealed that the gender distribution of the participants reflects higher males (79%) prevalence than females (21%). The majority of farmers in Tulkarem are in the middle of age. 56% are under 40 years old. 63.14% are married. As well as 79.4% of farmers in Tulkarem are educated. 73.1% worked only in agriculture. And 73.43 owned agricultural land.

In addition, 26.86% of participants were living in Al Sha'rawiya, 22.86% were living in Al-Kafriyat, 26.57% were living in Wadi Alshaeir and 23.71% were living in Tulkarem city and its suburbs. 55.4% are applying non-protective agricultural patterns (open field); while 11.7% are applying

protected agriculture system (greenhouses); and 32.9% their agricultural land was mixed of open field and greenhouses.

Also, the results revealed that the dominant cultivated plant species were tomato. 71% of farmers in studied area are facing agricultural related problems, the highest area that had agricultural problems were Al Sha'rawiya and Wadi Alshaeir, while the lowest were the Al-Kafriyat. In addition, the highest area that had agricultural extension services office were Wadi Alshaeir, while the lowest were the Al-Kafriyat. The majority of farmers in the study area are highly depending on chemical pesticides in controlling pests, as 96% were using pesticides in their agricultural land; the highly used type of these pesticides was Imidacloprid (Confidor®, Bayer). 91.7% were following the recommended pesticide's dose in application. 90.3% sprayed two or more mixed pesticides. 49.1% of participant’s crop was affected or damaged due to a failure to follow the appropriate dose or as a result of choosing an inappropriate pesticide. Just 44.3% of participants put a warning sign on the field sprayed with pesticides. In addition, 46.9% sprayed pesticides before pests infestation occurs.

Furthermore, 59.1% of participants didn't have any training on safety measures of pesticides application. 56.9% didn't participate in any courses to raise awareness about the dangers of pesticides to health and the environment. 62.6% didn’t have any training in integrated pest management, insect and disease identification and prevention. And 67.4%

didn’t have any training about the safe and environmentally disposal of agricultural pesticide containers.

On the other hand, 85.1% of participants were interested to find appropriate solutions to reduce the excessive use of pesticides. 90.6% of participated farmers believed that there is a need to optimize and manage the use of pesticides. As well as, 94% thought that the safety precautions are useful for protecting against the negative effects of pesticides.

About 30% of farmers were unsure if the type of pesticide they usually used is authorized and safe to use. 58.9% of farmers didn’t have first aid kits on the farm. 30% mentioned that there was no medical treatment center in their neighborhood area that provides medical services to farms if any accidental injury happened; also 15.4% mentioned that there are some difficulties in reaching the health center.

Moreover, 51.4% of participants don't classify pesticides "according to the degree of toxicity" when they stored it. In addition, 16.9% didn’t store pesticides and chemicals out of children's hand reach. 54.3% didn’t place a clear warning label on each storage container to warn of the dangers of chemicals or pesticides. 52.6% didn't have a dedicated place to store highly dangerous pesticides.

The study finding indicated that: There were significant differences among farmers in accordance to the geographical area in using pesticides in agricultural land; knowing the quantity of used pesticides; using the

recommended dose; placing a warning sign on the field sprayed with pesticides or where the pesticides are; calculate the required amount for spraying; check spray equipment before using pesticides; and use custom mixing tools.

Also, there were significant differences between education level and (reading the information on the pesticide card & following the written instructions; reading the pesticide label before use; calculate the required amount for spraying; confirm the expiration date; clean the spray tools after finishing the spraying process; hand washing after using pesticides; and change clothes after spraying).

In addition, there were significant differences between farmer's age and using safety measures in mixing pesticides.

As well as there were significant differences between gender and (placing a warning sign on the field sprayed with pesticides or where the pesticides are; use personal protective equipment when dealing with pesticides and chemicals; and use hands to mix without protection)

Finally, there were significant differences between training provided by governmental organization. Also, there were significant differences between training provided by nongovernmental organization and (examination of insect and disease samples before using the pesticide; use personal protective equipment when dealing with pesticides and chemicals; and adhere to the pre-harvest interval period of the pesticide).

5.2 Recommendations

- Priority is to be given (by Ministry of Agriculture and NGOs) to developing and implementing pesticide safety educational and certification programs for farmers. The training must address health effects associated with exposure to pesticides, the effects of pesticides on the environment, diversification in the use of pesticides, adhere to the appropriate dose, choose the right pesticides, follow safety measures during and after using pesticides, improvements in disposal and storage of pesticides, pesticide risk reduction strategies, and understanding of the pesticide regulatory framework in Palestine.

- Ministry of Agriculture and NGOs shoud provide training and instruction to pesticide dealers to increase their knowledge of pesticides and improve their awareness, since they are an important source of information related pesticides.

- Ministry of Agriculture and NGOs shoud work to find appropriate solutions to reduce the excessive use of pesticides. And development new pesticides with novel modes of action and improved safety profiles and the implementation of alternative cropping systems that are less dependent on pesticides.

- Ministry of Agriculture and NGOs shoud enhance safe agriculture production approaches as the adoption of integrated pest management and biological Control to reduce the demand on chemicals.

- Implementing educational courses by Ministy of Health in the field of first aid, and working to provide first aid kits on the farms, in order to urgently deal with any health problem caused by pesticides.

- The Ministry of Agriculture should work to provide an agricultural engineer or agricultural technician, to give the necessary advice to farmers and to answer their inquiries.

- Provide farmers with personal protective equipment at reasonable prices.

- Responsible ministries should restrict the importation, sale and the use of highly hazardous pesticides.

- Farmers should use appropriate and well-maintained spraying equipment along with taking all the precautions required in all stages of pesticide handling .

- Responsible ministries should promote scientific and social initiatives to make development and use of alternatives to pesticides more competitive in a wide variety of managed and natural ecosystems.

- Increase the ability and motivation of agricultural workers to lessen their exposure to potentially harmful chemicals and enforce compliance with worker-protection regulations.

- Ministries of agriculure and Health should be evaluate pesticides in conjunction with all other alternative management practices not only with respect to efficacy, cost, and ease of implementation but also with respect to long-term sustainability, environmental impact, and health.

- Apply intervention strategies by responsible ministries to strengthen enforcement mechanisms of current pesticide laws, through regular surveillance and monitoring pesticide safety compliance to promoting safe pesticide use .

- Responsible ministries should do their role in research, product development, product testing and registration, implementation of pesticide use strategies, and public education about pesticides.

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Annex (1)

Insecticides, Acaricides and Nematicides in Palestine

SN	Brand Name	Contant a.i.	Formulator	Generic Name
1	Alsystin	25%	Bayer crop science	Triflumuron
2	Evisect S	50%	Arysta lifscience co.	Thiocyclam hydrogen oxalate
3	Acremakten	18g/L	Burchemresearch	Abamectin
4	Acrimite	550g/L	Cerexagri	Fenbutatin Oxide
5	Insegar	25%	Syngenta	Fenoxycarb
6	Ipon	20%	Mitsui chemicals inc	DINOTEFURAN
7	Aplord	250g/L	Nihon nohyaku	Buprofezin
8	Apollo	50g/L	Irvita plant protection	Clofentezine
9	Attabron	50g/L	ISK	Chlorfluarzuron
10	Agremic	18g/L	Dr. meron	Abamectin
11	Azgan	----	Du kedem project ltd	Azadirachtin
12	Avant	150g/L	Dupont	Indoxacarb
13	Akterah	240g/L	Syngenta	Thiamethoxam
14	Annivers	50g/L	Mitsui Toatsu	Halfenprox
15	Oberon	240 g/L	Liad chemicals	SPIROMESIFEN
16	Orthene	75%	Arvestacorp	Acephate
17	X mite	150g/L	Agro-Kanesho Co.	Acequinocyl
18	ECOGANE EMFAR	----	Du kedem project ltd	Neem Oil+Pkant Oil+Pyrethrum
19	ECOGAN BARAK	----	Du kedem project ltd	Neem Oil + Pkant Oil + Pyrethrum
20	Ezidor	30g/L	Fortune biotech	Azadirachtin
21	Baythroid	50g/L	Lied Chemical	Cyfluthrin
22	Pegasus 50	500g/L	Syngenta	Diafenthiuron
23	Pegasus 25	250g/L	Syngenta	Diafenthiuron
24	Pride	200g/L	Gowan	Fenazaquin
25	Peropal	25%	Lied Chemical	Azocyclotin
26	Becis	25g/L	Bayer crop seince	Deltamethrin
27	Bektosfen	8400 Iu/mg	Valent Biosciences	Bacillus Thuringinsis
28	Bakten	18g/L	Lied Chemical	Abamectin
29	Botanigard	----	Laerlam international corp	Beauveria Bassiana
30	Botrix	550 g/l	Sipcam	Fenbutatin oxide
31	Polo 25	250g/L	Syngenta	Diafenthiuron
32	Polo 50	500g/L	Syngenta	Diafenthiuron
33	BONANZA	500g/L	Indalva quimica	Diafenthiuron
34	Pyrtlin	1%	Macondray plastics	Chlorpyrifos
35	Pyrinex	5%	Makhteshim chemical works Ltd.	Chlorpyrifos

36	Pyrinex 48	479g/L	Makhteshim chemical works Ltd.	Chlorpyrifos
37	Bio. BIT.	8400 Iu/mg	Valent Biosciences	Bacillus Thuringinsis
38	Bio. T.	8000 Iu/mg	Bio dlih	Bacillus Thuringinsis
39	Bio. T.+	16000 Iu/mg	Bio dlih	Bacillus Thuringinsis
40	Bio. TION.	8000 Iu/mg	Rimi chemical	Bacillus Thuringinsis
41	Bionem	3-3.5 %	Minrb	Bacillus Firmus
42	Bionem	5%	Minrb	Bacillus Firmus
43	Biosafe	----	Minrav	Bacillus Firmus
44	Biophytos SB	----	Euphytor	Rotenone, Pyrethrum natural
45	Tiger	100g/L	Agan	Pyriproxyfen
46	Tracer super	240g/L	Dow Agrosciences	Spinosad
47	Tarsip	200g/L	Tersis Ltd.	Cypermethrin
48	Trigard	75%	Syngenta	Cyromazine
49	Chess	50%	Syngenta	Pymetrozine
50	Tlon 2	94%	Dow Agrosciences	Dichloropropene
51	Totach	----	Du kedem project ltd	Neem Oil + Pyrethrum Natutral
52	Tokuthion	500g/L	Lied chemical ltd.	Prothiofos
53	Titan 20	200g/L	Luxembourg Chemical	Cypermethrin
54	Tedion	80g/L	Luxembourg Chemicals Ltd	Tetradifon
55	Thuricide	----	Certis USA	Bacillus thuringiensis
56	Tork	550g/L	Basf	Fenbutatin oxide
57	Tontar	550g/L	Cerexagri	Fenbutatin oxide
58	Ganim 1500	----	Du kedem project ltd	Azadirachtin
59	Gusation	25%	Bayer AG	Azinphos-methyl
60	Decis	25g/L	Bayer crop seince	Deltamethrin
61	Dalfen	32000 Iu/mg	Certis	Bacillus Thuringinsis
62	Dor-on	480g/L	AIMCO	Chlorpyrifos
63	Dorbas	480g/L	Makhteshim Chemical Works Ltd.	Chlorpyrifos
64	Dorsan	5%	Frunol	Chlorpyrifos
65	Dorsan 4	479g/L	Luxembourg Chemicals Ltd.	Chlorpyrifos
66	Dorsban	5%	Dow Agrosciences	Chlorpyrifos
67	Dorsban 4	479g/L	Dow Agrosciences	Chlorpyrifos
68	Dybs	1000g/L	Denka International	Dichlorvos
69	Deritenone	----	Deraner BU	Rotenone
70	Dafel	16000 Iu/mg	Valent biosciences co.	Bacillus Thuringinsis
71	Divipan 100	1000g/L	Makhteshim chemical works Ltd.	Dichlorvos
72	Divipan 5%	5%	Makhteshim chemical works Ltd.	Dichlorvos

73	Divipan Laido	1000g/L	Makhteshim chemical works Ltd.	Dichlorvos
74	Dimethoate	400g/L	Tarsis Ltd.	Dimethoate
75	Demol	98%	Drexel	Parffinic oil
76	Dimilin	25%	Chemtura USA	Diflbenzuron
77	Ragby	200g/L	FMC Crop	Cadusafos
78	Runer	240g/L	Dow Agrosciences	Methoxyfenozide
79	Rmsen	1%	Rimi chemical	Chlorpyrifos
80	Root Shield	----	Bloworks INC	Trichoderma Harzianum
81	Rogor 40	400g/L	Cheminova	Dimethoate
82	Rufast	75%	Cheminova	Acrinathrin
83	Romacten	18g/L	Rotam HK	Abamectin
84	Rimon	100g/L	Makhteshim chemical works Ltd.	Novaluron
85	Zohar PT-50	500g/L	Zohar Factory	Detergent (soap soluation)
86	Zohar LQ-215	17%	Zohar Factory	Detergent (soap soluation)
87	Zoharnet	470g/L	Zohar Factory	Detergent (soap soluation)
88	J M S oil	97.20%	J.M.S. Flower inc.	Mineral Oil
89	Sitol oil	80%	Brandt Conolidated	Petroleum Oil
90	Sbidar	110g/L	Sumitomo	Ethoxazol
91	Stop ants	----	PIC corporation	Ortho Boric Acid+Sodium Tetraborate Pentahydrate
92	Safsan 1015	15%	Rimi Chemicals Co Ltd.	Sodium fluosilicate
93	Safsan 515	15%	Rimi Chemicals Co Ltd.	Sodium fluorosilicate
94	Cymbush 10	100g/L	Makhteshim chemical works Ltd.	Cypermethrin
95	Cmshofr	200g/L	Makhteshim chemical works Ltd.	Cypermethrin
96	Sensor	300g/L	Mitsui Toatsu	Etofenprox
97	Siperin 10	100g/L	Rimi Chemicals ltd.	Cypermethrin
98	Siperin 20	200g/L	Rimi Chemicals ltd.	Cypermethrin
99	Citrona OL	82%	Tarsis Ltd.	Summer oil
100	Sesamin	70%	Brandth co.…	Sesame oil
101	SAF-T-Side	80%	Brandt Conolidated	Petroleum Oil
102	Sherpaz	100g/L	Makhteshim + Rallis India	Cypermethrin
103	Shom Herk	15g/L + 0.5 g/L	Multicrop	Garlic extract+ Pyrethrum natural
104	Sufa	520g/L	Drexel	Sulphur
105	Frcotyl	18g/L	Sinon	Abamectin
106	Frobit	25000 Iu/mg	Certis USA	Bacillus Thuringinsis
107	Florbak	8500 Iu/mg	Valent Biosciences	Bacillus Thuringinsis Varaizawai

108	Flormait	240g/L	Chemtura (pty)	Bifenazate
109	Vitol OL	80%	Makhteshim chemical works Ltd.	Summer oil
110	Vertimec	18g/L	Synggenta	Abamectin
111	Verto - M	18g/L	Sinon	Abamectin
112	Vertigo	18g/L	Denka International	Abamectin
113	Virotar OL	80%	Tarsis Ltd.	Summer oil
114	Virol OL	80%	Makhteshim chemical works Ltd.	Summer oil
115	Vintrazol	----	TAPAZOL	Mineral oil
116	Cotnion 20	200g/L	Makhteshim Chemical Works Ltd.	Azinphos-methyl
117	Cotnion 20	200g/L	Makhteshim Chemical Works Ltd.	Azinphos-methyl
118	Cotnion 25	25%	Makhteshim Chemical Works Ltd.	Azinphos-methyl
119	Cotnion 8	8%	Makhteshim Chemical Works Ltd.	Azinphos-methyl
120	Karate	50g/L	Syngenta	Lambda Cyhalothrin
121	Carpolin	250 g/l	D. Miron	Carbosulfan
122	Cascade	50g/L	BASF	Flufenoxuron
123	calybso	480g/L	Lied Chemical	Thiacloprid
124	King Bo	(0.2% + 0.4%) w/w	Zand Dynsty Company LTD.	Oxymatrine + Prosuler
125	Kandor	91.70%	Dow Agrosciences	Dichloropropene
126	Confidor	350g/L	Lied Chemical	Imidacloprid
127	Copra	100g/L	Denka INTERNATIONAL	Pyriproxyfen
128	kung fu	50g/L	Syngenta	Lambda Cyhalothrin
129	CONFIDENCE	350g/L	CHEMIA SPA	Imidacloprid
130	KOHINOR	350g/L	Lied Chemical	Imidacloprid
131	Keshet	25g/L	Makhteshim chemical works Ltd.	Deltamethrin
132	Lamdex	50g/L	Makhteshim chemical works Ltd	Lambda Cyhalothrin
133	Levanola	82%	Tarsis Ltd.	Summer oil
134	Match	50g/L	Syngenta	Lufenuron
135	Magister	200g/L	Gowan	Fenazaquin
136	Marshal 25	EC	FMC Crop.	Carbosulfan
137	Miteclean	102.4 g/L	Sankyo Agro.	Pyrimidifen
138	Meteor	50g/L	Nihon nohyaku	Fenpyroximate
139	California Mixture	250 g/l	K.L.N Ltd	Calcium Polysulphid
140	Masai	20%	BASF	Tebufenpyrad
141	Mesurol	500g/L	Lied Chemical	Methiocarb

142	Mesurol	5%	Lied Chemical	Methiocarb
143	Mosblan	20%	AGAN	Acetamiprid
144	Mosblan	200g/L	AGAN	Acetamiprid
145	Molit	150g/L	BASF	Teflubenzuron
146	Metasystox	250g/L	Lied Chemical	Oxydemethon methyl
147	Mitac	200g/L	Arista	Amitraz
148	Melpnok	9.3g/L	Sankyo co.	Milbemectin
149	Neroopaz	80%	Makhteshim chemical works Ltd.	Summer oil
150	Neemacor 10	10%	Bayer	Fenamiphos
151	Neemacor 400	400g/L	Lied chemical	Fenamiphos
152	Neropaz 80	80%	Makhteshim chemical works Ltd.	Summer oil
153	Nerola	99.25%	Tarsis Ltd.	Summer oil
154	Neron 250	250g/L	Dr. Miron	Bromopropylate
155	Nimgard	97%	Certis USA	Neem Oil
156	Nimtol	97%	Fortune biotech	Neem Oil
157	Neemix 45	45g/L	Certis USA	Azadirachtin

Source: (General Administration of Pharmacy, 2019).

Annex (2)

Fungicides & Bactericide in Palestine

S.N	Brand Name	Contant a.i.	Formulator	Generic name
158	Abeir	250g/L	Dow Agrosciences	Quinoxyfen
159	ORTIVA TOP	(200+125) g/L	Syngenta	Azoxystrobin + Difenoconazole
160	ETHELETE	50%	Anhui fengle agrochemical	Dimethomorph
161	Acrobat	9% + 60%	BASF	Dimethomorph + Mancozeb
162	Indar	50g/L	Dow Agrosciences	Fenbuconazole
163	Anvil	50g/L	Syngenta	Hexaconazole
164	Euparen Multi	50%	Lied chemical	Tolylfluanid
165	Orios	250 g/l	Irvita	Tebuconazole
166	Ofir	100 g/l	Dr. Miron	Penconazole
167	Ofir 2000	200g/L	Syngenta	Penconazole
168	Octav	50%	Bayer	Prochloraz manganese
169	ALIETTE	80%	Bayer	FOSETHYL ALUMINIUM
170	Amco - M	70%	Nippon soda	Thiophanate methyl
171	Amistar	250g/L	Syngenta	Azoxystrobin
172	Antracol	70%	Lied chemical	Propineb
173	Ohaio	500g/L	ISK Japan	Fluazinam
174	AQ 10	$5*10^9$	Ecogen	Ampelomyces Quisqualis
175	EOS	99%	SK corporation	Mineral Oil
176	Bayfidan	250g/L	Lied chemical	Triadimenol
177	Baycor	25%	Bayer	Bitertanol
178	Parasol	77%	Nufarm	Copper hydroxide
179	Prupica	50%	Kumiai chem.	Mepanipyrim
180	previcur	722g/L	Bayer	Propanocarp HCL
181	Bazamid	98%	Basf	Dazomet
182	Plantax	75%	Chemtura (PTY)	Oxycarpoxin
183	Blu shild	77%	Cuproquim	Copper hydroxide
184	Blekiot	40%	Nippon soda	Iminoctadine tris
185	Punch 40	400g/L	Dupont	Flusilazole
186	Bogard	250 g/l	Dr. Merion	Difenozonazole
187	Bordozol	80%	Tabozol	Copper Sulphate
188	Busan	300g/L	Buckman Lab.	TCMTB
189	Polar	50%	Kaken Pharm	Polyoxin-AL
190	Poliram DF	70%	BASF	Metiram
191	Polyron	250 g/l	Dr. Miron	Tebuconazole
192	Bavistin	50%	Basf	Carbendazim
193	Terraclor	75%	AMVAC	Quintozene (PCNB)
194	Triziman	80%	Cerexagri	Mancozeb
195	Teldor	500g/l	Bayer	Fenhexamid

196	Telem	410g/l	Nihon nohyau	Flutolanil
197	Topaz	70%	Nippon soda	Thiophanate methyl
198	Topnex	100 g/l	Glopachem	Penconazole
199	Topenko	100 g/l	Glopachem	Penconazole
200	Tebax	45%	Indalva Quimica	Tebuconazole
201	Timorex Gold	----	Biomor	Tea Tree Oil
202	Thaiovit	80%	Syngenta	Sulphur
203	Gafribk	70%	Spyros Bioscience	Sulphur
204	Gafritp	80%	Spyros Bioscience	Sulphur
205	Gofrithar	825g/L	Cerexagri	Sulphur
206	Galben M	8% +65%	Isagro	Benalaxyl + Mancozeb
207	Hosan	125g/L	Cheminova	Flutriafol
208	Daconil	82.50%	Syngenta	Chlorothalonil
209	Dynone	722g/L	Bayer	Propanocarp HCL
210	Delsene	50%	Dupont	Carbendazim
211	Delan	500g/L	BASF	Dithianon
212	Dotan – proplant	722g/L	Chimac Agriphar	Propamocarp HCL
213	Dorado 200	200g/L	Syngenta	Pyrifenox
214	Dengle	50%	Anhui fengle agrochemical	Dimethomorph
215	Rally	200g/L	DOW agrosciences	Myclobutanil
216	Resec	250+250g/L	Sumitomo	Carbendazim + diethofencarb
217	Rubigan	120g/L	Gwoan	Fenarimol
218	Rot pro	Cful5*10^7	Mycontrol	Trichoderma harzianum
219	Root Pro	5*10^7	Mycontrol LTD	Trichoderma Harzianum
220	Ridomil gold M. Z	4 + 64%	Syngenta	Mefenoxam + Mancozeb
221	Rodion	500g/L	Agriphar	Iprodione
222	Rovral nozel	500g/L	Bayer	Iprodione
223	Rovral 50	50%	Bayer	Iprodione
224	Roxam	8.3% + 66.7%	Dow agroscience	Zoxamide + Mancozeb
225	Ridomil gold – CU plus	40 + 2.5 %	Syngenta	Copper oxychloride + Mefenoxam
226	Ridomil gold nozl	480g/l	Syngenta	Mefenoxam
227	Risolex 50	50%	Sumitomo	Tolclofos methyl
228	Ringo	202 g/L	Sumitomo Co.	Metominostrobin
229	Sancozeb	80%	DOW agrosciences	Mancozeb
230	Saparol	190g/L	Sumitomo	Triforine
231	Sterner	20%	Sumitomo	Oxolinic acid
232	Stroby	50%	Basf	Kresoxim methyl
233	Score	250g/L	Syngenta	Difenoconazole
234	Celest	100g/L	Syngenta	Fludioxonil

235	Silvacur	40 +10 %	Bayer Ag	Dichlofluanid+Tebuconazole
236	Salfo Ron	720g/L	Probelte	Sulphur
237	Salfo le	650g/L	Calliope	Sulpher
238	Switch	37.5 + 25 %	Syngenta	Cyprodinil + fludioxonil
239	Citrole	97%	Total Solvents	Mineral Oil
240	Signum	(6.7+26.7) %	BASF	Pyraclostrobin + Boscalid
241	Serenade ASO	----	Agra Quest	Bacillus Subtilis
242	Saymon	50%	Indalva Qumica	Cymoxanyl
243	Champion	77%	Nufarm	Copper hydroxide
244	Shavit	250g/L	Makhteshim chemical works Ltd.	Triadimenol
245	Shemer	56%	Agrogreen	Metschnikowia Fructicola
246	Sufa	720g/L	Drexel	Sulphur
247	Vectra	100g/L	Bayer	Bromuconazole
248	Flint	50%	Bayer	Trifloxystrobin
249	Folicur	250g/L	Lied Chemical	Tebuconazole
250	Folio Gold	(37.5+500) g/L	Syngenta	Metalaxyl M + Chlorothalonil
251	Funguran	77%	Urania agro.	Copper hydroxide
252	Fyten	45%	Sipcam	Cymoxanil
253	Firos	300g/L	Chemica Agripha	Pyrimethanil
254	Sulpher	99.90%	Agrindustria	Sulpher
255	Sulphur	90%	Makhteshim chemical works Ltd.	Sulpher
256	Sulpher	99.90%	Solvay catalysts	Sulpher
257	Sulphur	70%	Makhteshim chemical works Ltd.	Sulpher
258	Sulphur	99%	Agan	Sulpher
259	Sulphur	99.97%	Agrindustria	Sulpher
260	Copper Sulphate	98%	Amia	Copper Sulphate
261	Copper Sulphate	98%	Okonopt Ural	Copper Sulphate
262	Copper Sulphate	98%	Tai Ammon	Copper Sulphate
263	Kaligren	80%	Otsuka Chemical	Potassium bicarbonate
264	Canon	500g/L	Luxembourg Chemical Ltd.	Potassium phosphite
265	Cupro Antracol	17.5+37%	Lied Chemical	Propineb + Copper oxychlorde
266	Copman	3.88 + 66.7 %	Rimi chamical	Copper hydroxide + mancozeb
267	Cordon	850g/L	Lainco S.A.	Potassium phosphite
268	Kocide 101	77%	DUPONT	Copper hydroxide
269	Kocide 2000	53.80%	DUPONT	Copper hydroxide
270	Kocide DF	61.40%	DUPONT	Copper hydroxide
271	Kumulus	80%	Basf	Sulphur

272	Consento	375g/l + 75g/l	Bayer crop science	Propamocarb HCL + Fenamidone
273	Mancotal	80%	CEREXAGRI	Mancozeb
274	Marit	12.50%	Sumitomo	Diniconazole
275	Milvan	10%	Hokko	Polyoxin B
276	Manzidan	80%	DOW AGROSCIENCES	Mancozeb
277	Mancozan	80%	CEREXAGRI	Mancozeb
278	More	----	DU KEDEM PROJECT LTD	Potassium hydrogen carbonate + Copper sulfate
279	Momento	250g/L	Chemia SPA	Pencycuron
280	Monceren	250g/L	Lied chemical	Pencycuron
281	Mithos	300 g/l	Lied chemical	Pyrimethanil
282	Mirage	50%	Makhteshim chemical works Ltd.	Prochloraz zinci
283	Mirage 45	450 g/l	Makhteshim chemical works Ltd.	Prochloraz
284	Microthiol	80%	Cerxagri	Sulphur
285	Melody Duo	5.5% + 61.25%	Lied chemical	Iprovalicarb+ Propineb
286	Nat 35	----	BIO dalia	Potassium sal Fatty acid
287	Namrod	250 g/l	Makhteshim chemical works Ltd	Bupirimate
288	Halogafrit	700g/L	Action Pin	Sulphur

Source: (General Administration of Pharmacy, 2019).

Annex (3)

Herbicides & Defoliants in Palestine

SN	Brand Name	Contant a.i.	Formulator	Generic name
289	Agrein 500	500 g/L	Syngenta	Terbutryne
290	Express	75%	Dupont	Tribenuron methyl
291	Amber	75%	Syngenta	Triasulfuron
292	Amign 65	25+40%	Agan	Terbutryne + Ametryne
293	Amcogol	240g/L	Sinon Crop.	Oxyfluorfen
294	Oust 75	75%	Dupont	Sulfometuron methyl
295	Ustilan	70%	Bayer	Ethidimuron
296	Aflon	500g/L	Agan	Linuron
297	Aminbar	96.90%	Nufarm	2,4-D salt
298	Aurora	40%	FMC	Carfetrazone ethyl
299	Alber 40	500g/L	Makhteshim	2,4-D (Tri-ethanol amine salt)
300	Albur super	335g/L	Makhteshim	2,4-D
301	Pendel	330 g/L	Shandong Huayang	Pendimethalin
302	Betanal	157g/L	Bayer	Phenmedipham
303	Pursuit	100g/L	BASF	Imazethapyr
304	Prometrex	500g/L	Agan	Prometryne
305	Prometron	500g/L	Sipacam	Prometryne
306	Promegard	500g/L	Syngenta	Prometryne
307	Pilaround	480g/L	Pilarquim	Glyphosate isopropy amine salt
308	Basta 20	200g/L	Bayer	Glufosinate ammonium
309	Baster	200g/L	Tabozal	Glufosinate ammonium
310	Benefex 18	180g/L	Agan	Benfluralin
311	Boral	480g/L	FMC	Sulfentrazone
312	Puma super	69+18.8 g/L	Bayer	Fenoxaprop -P- ethyl + MefenpyrDiethyl
313	Bedozol TL	220 + 250 g/L	Agan	Ammonoium thiocyanate + Aminotriazole
314	Pyramin	65%	Basf	Chloridazon (Pyrazon)
315	Bilot soper	100g/L	Nissan	Quizalofop-p- ethyl
316	Touchdown	480g/L	Syngenta	Glyphosate Trimesium (sulfate)
317	Terbutrex	500g/L	Agan	Terbutryne
318	Treflan	480g/L	Dow Agrosciences	Trifluralin

319	Triflurex	480g/L	Agan	Trifluralin
320	Trable	480g/L	Chimac Agriphar	Triclopyr BUTOTYL
321	Topik	25g/L + 100g/L	Syngenta	Cloquintocet + Clodinafop Propargyl
322	Challenge	600g/L	Bayer	Aclonifen
323	Tordon 101	102g/L + 396g/L	Dow Agrosciences	Picloram + 2,4-D
324	Tostar	75%	Generex Australia	Sulfometuron methyl
325	Tomahawk	200g/L	Agan	Fluroxypyr
326	Tiara	60%	Bayer	Flufenacet
327	Titus	25%	Dupont	Rimsulfuron Methyl
328	Taifun	480g/L	Tabozal	Glyphosate Isopropy Amine Salt
329	Galoop	480G/L	Dr. Miron	Glyphosate Isopropyl Amine Salt
330	Garlon	480g/L	Dow Agrosciences	Triclopyr BUTOTYL
331	Gallant Super	104g/L	Dowelanco	Haloxyfop^{R} Methyl Ester
332	Galon	240g/L	Sinon Crop.	Oxyfluorfen
333	Galigan	240g/L	Agan	Oxyfluorfen
334	Glyphogan	480g/L	Agan	Glyphosate Isopropy Amine Salt
335	Glyphos	480g/L	Luxembourg Chemical	Glyphosate Isopropy Amine Salt
336	Glefon	480g/L	Xinanjiang	Glyphosate Isopropy Amine Salt
337	Goal GR	2%	Rimi Chemicals ltd	Oxyfluorfen
338	Goal	238g/L	Dow Agrosciense	Oxyfluorfen
339	Deganol F	150 g/L	Syngenta	Fluazifop -P- butyl
340	Derby	75+100g/L	Dow Agrosciense	Florasulam+Flumetsulam
341	Dual S. gold	45+915g/L	Syngenta	Benoxacor + Metolachlor-S
342	Dosanex 80	80%	Basf	Metoxuron
343	Raft	400g/L	Bayer	Oxadiargyl
344	Roundup	480g/L	Monsanto	Glyphosate isopropy amine salt

345	Roundmor	480g/L	Pilarquim	Glyphosate isopropy amine salt
346	Roundpaz	480g/L	Agan	Glyphosate isopropy amine salt
347	Ronstar	250g/L	Batyer	Oxadiazon
348	Racer	250g/L	Agan	Flurochloridone
349	Zohar OC-6	500g/L	Zhr dlih	Anionics&nonionics
350	Dropp ultra	60+120g/L	Bayer	Diuron+Thidiazuron
351	Sanafen Super	350g/L	Dow Agrosciences	2,4-D Iso Octyl Ester
352	Septer	150g/L	BASF	Imazaquin
353	Starane	200g/L	Dow Agrosciences	Fluroxypyr
354	Strike	50%	Sumitomo	Flumioxazin
355	Striptease	60+120g/L	Chemia SPA	Diuron+Thidiazuron
356	Stomp	330g/L	BASF	Pendimethalin
357	Staple	85%	Kumiai Chemical Ind	Pyrithiobac Sodium
358	Spotlight	60g/L	FMC	Carfetrazone ethyl
359	Select Supr	116g/L	Arysta lifesciece	Clethodim
360	Senpshot	0.5% + 2%	Dow Agrocience	Isoxaben + Trifluralin
361	Sencor 70	70%	Bayer	Metribuzin
362	Surflan	480g/L	Dow Agrosciences	Oryzalin
363	Sonalan	333g/L	Dowelanco	Ethalfluralin
364	Shugn	100g/L	Agan-Quena	Propaquizafop
365	Flex	250g/L	Syngenta	Fomesafen
366	Floren or Eflurin	480g/L	Hockley int.	Trifluralin
367	Fantrh	40g/L	Uniroyal	Quizalofop-p- tefuryl
368	Focus Ultra	100g/L	Basf	Cycloxydim
369	Fuzilade froty	150 g/L	Syngenta	Fluazifop -P- butyl
370	Cadre	240g/L	BASF	Imazapic
371	Cottogan	500g/L	Agan	Fluometuron
372	Cottolint	500g/L	Nufarm	Fluometuron
373	Quartz	500g/L	Bayer	Diflufenican
374	Command	360g/L	FMC	Clomazone

375	Lentagran	600g/L	Syngenta	Pyridate
376	Lentmol D	480g/L	Nufarm	2,4-D Iso Octylester
377	Loabord 10	100g/L	Agan	Quizalofop-p- ethyl
378	Lotuse	200g/L	Nufarm	Cinidon Ethyl
379	Lontrle	100g/L	Dow Agroscience	Clopyralid
380	Linor	410g/L	Drexel USA	Linuron
381	Linurex	500g/L	Agan	Linuron
382	Mag 18	230g/L	Palindent Ltd	Magnesium chlorate
383	Amitrex	500g/L	Agan	Ametryne
384	Hosar	5% +15%	Bayer	Iodosulfuron methyl sodium + Mefenpyr diethyl
385	Hybar X	80%	Dupont	Bromacil
386	Weed Stop	330 g/L	Shandong Huayang	Pendimethalin

Source: (General Administration of Pharmacy, 2019).

Annex (4)

Molluscides in Palestine

SN	Brand Name	Contant a.i.	Formulator	Generic Name
387	Eskar GO	6%	Chiltern	Metaldehyde
388	Metazon	5%	Rimi chemical	Metaldehyde
389	Metazon 200	5%	Rimi chemical	Metaldehyde

Source: (General Administration of Pharmacy, 2019).

Annex (5)

Rodenticide in Palestine

SN	Brand Name	Contant a.i.	Formulator	Generic Name
390	Ratimon	0.25%	Lipha	Bromadiolone
391	Ratimon G	0.01%	Lipha	Bromadiolone
392	Ratimon L	2.50%	Lipha	Bromadiolone
393	Racumin	0.04%	Bayer	Coumatetralyl
394	Racumin 57	0.75%	Lied chemical	Coumatetralyl

Source: (General Administration of Pharmacy, 2019).

Annex (6)

Fumigants in Palestine

SN	Brand Name	Contant a.i.	Formulator	Generic Name
395	Phostoxin	56%	Detia degesc	Aluminium Phosphide
396	Bromobec 70	30% + 70%	Trcobot Brom	Chloropicrin + Methyl Bromide
397	Mtbrom 980	2% + 98%	Trcobot Brom	Chloropicrin + Methyl Bromide
398	Talobek	34.7% + 61.1%	Trcobot Brom	Chloropicrin + Methyl Bromide
399	Metfume 98	2% + 98%	Trcobot Brom	Chloropicrin + Methyl Bromide
400	Magtoxin	66%	Detia Degesc	Magnesium Phosphide
401	Adukim	370g/L	Kemda	Metham Sodium
402	Adegan	370g/L	Agan - Taminco	Metham Sodium
403	Metmor	510g/L	Fmc	Metham Sodium
404	Mtbrom 100	100%	Trcobot Brom	Methyl Bromide
405	Nemasol	510g/L	Agan - Taminco	Metham Sodium

Source: (General Administration of Pharmacy, 2019).

Annex (7)

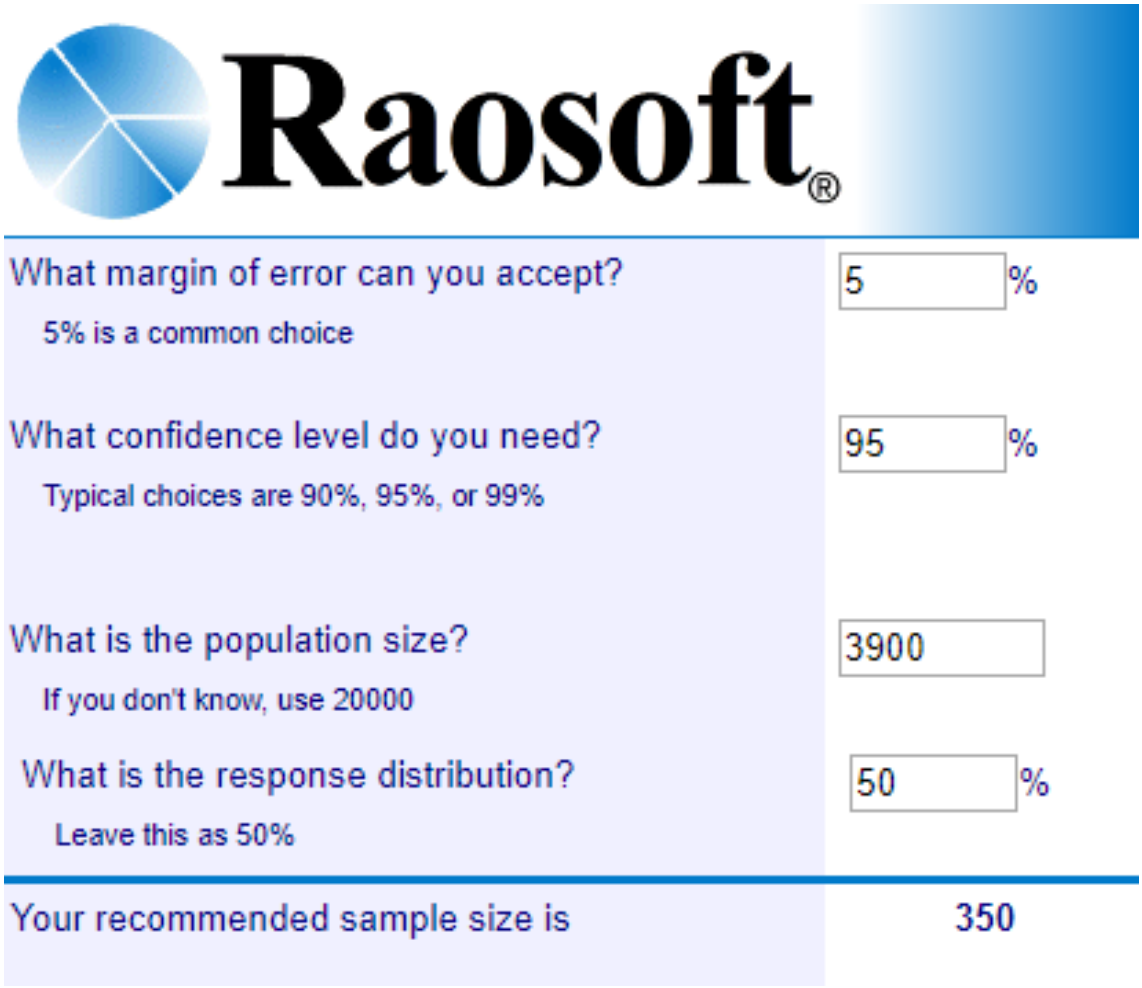
Chemicals allowed for use in agriculture

SN	Brand Name	Contant a.i.	Formulator	Generic Name
406	L I 700	750g/L	Newmane	Phosphatidylcholine
407	Aspire	55%	Ecogen	Candida oleophila
408	Al- Buit	320g/L	Tapozal	Methyl silicon
409	Al-Rahaf	300g/L	Nalco	Polyvinyl polmer
410	Alfa 4	4%	Reimi Chemical	Glucochloralose
411	Amperk	28%	Pbi- Gordon	Mefluidide
412	Berelex	10%	Vallent Bioscience	Gebberellic acide
413	Berelex	40g/L	Makhteshim chemical works Ltd.	Gebberellic acide
414	Britex	18%	Seef fek	Shellac
415	Bominal	50.00%	Lied chemical LTD.	Protein hydrlysate
416	T.O.G	150g/L	Achim malshen	Hydroxquinoline
417	Tapazeal	60%	Tpozal	Asphalt
418	Triton x	990g/L	Agan	Octyl phenyl polyether alcohol
419	Triton B	770g/L	Rohm & Has	Phthalic glycerole alkyl resins
420	Tardimon	4%	Dr. Meron	Glucochloralose
421	Tardimon 100	100%	Dr. Meron	Glucochloralose
422	Taf	848g/L	Tpozal	Alkyl aryl polyether alcohols
423	Tofas	33g/L	Agriphar	3,5,6-TPA
424	Topflor	15g/L	Dow Agrosciences	Flurprimidol
425	Teag	40g/L	Qianjiarg Biochemical	Gebberellic acide
426	Gibberlon	40g/L	Fine Agro.	Gebberellic acide
427	Golper	10g/L	Yiangsu institute	Foechlorfenuron
428	Hanaton	50.40%	L. Gobbi	Naphthoxyacetic acide (B)
429	Alegant	50.40%	L. Gobbi	Naphthoxyacetic acide (B)
430	Hotay	80mg	Shin Estu	Codlemon
431	Dabgan	400g/L	Agan	Polyvinyl polmer
432	Dabak	400g/L	Tapozal	Polyvinyl polmer
433	Dko knofel	400g/L	Seef fek	Guazatine
434	Dorsi	500g/L	Nippon carbide	Hydrogen cynamide
435	Dormex	500g/L	Degussa	Cyanamide
436	Dong	120g/L	Seef fek	Shellac
437	Dongal brtex	180g/L	Seef fek	Carnuba wax
438	Dongal	100%	Amigal Chemical	Carnuba wax
439	Dongal 410	180g/L	Amigal Chemical	Carnuba wax

440	Dongal 610	185g/L	Amigal Chemical	Carnuba wax
441	Reiox	0.10%	Stahler agrochemie	Hydroxquinoline
442	Rimyfot	60%	Rimi Chemcal	Polybutene
443	Rimyfot	80%	Rimi Chemcal	Polyisobutane
444	Rimyfot	25%	Rimi Chemcal	Polyisobutane
445	Royal 30	180g/L	Uniroyal Chemical	Malic hydrazide
446	Zoom	45%	Gh Company	Asphalt
447	Sfyon	10g/L	Degussa	Foechlorfenuron
448	Shatah	920g/L	Makhteshim chemical works Ltd.	Alkyl phenol ethylene oxide condensate
449	CHECKMATE	17.54%	Suterra	Codlemon
450	Shelegeza	80%	Ronyfal Technology	Calcium carbonate
451	Shld	95%	Willbor Fllis	Kaolin
452	Soda bicarbonate	2%	Seef fek	Soda bicarbonate
453	Citrashine	90g/L	Cerexagri iberica	Coumrone inden resin
454	Farmon	8%	Certis	Gossyplure
455	Frogib 4	33g/L	Vallent Bioscience	Gebberellic acide
456	Frigate	800g/L	Isk- Biotech	Tallow amine ethoxylate
457	Fectar	250g/L	Mannifex	Mepiquate chloride
458	Fix	50g/L	Basf	Mepiquate chloride
459	Fexol 350	42g/L	Synthron	EDDHAS
460	Arbin	22%	Agrunol stahler	Phenols
461	Fenesh	60+480g/L	Bayer cropscience	Cyclanilide + ethophen
462	Ktelm	50%	Sepro	Flurprimidol
463	Col Fix	40%	Rimi Chemical	Polyvinyl alcohol
464	Col Fix	50%	Rimi Chemical	Polyvinyl alcohol
465	Canon	500g/L	Loxmporge	Phosphoric acid
466	Cultar	250g/L	Syngenta	Paclobutrazole
467	Kinetic	99%	Stere chem.	Polydimethyl siloxane
468	Magic	50g/L	Agan	Uniconazole
469	Mdawao	250g/L	Afal	Paclobutrazole
470	Mchtah	1105g/L	Syngenta	Octyl phenol octagycol ether
471	Meshteh L77	100%	Witco	Dimethyl polysiloxanes
472	Mshtah	600g/L	Dr. Meron	Alkyl phenoxy polyethyl ethanol
473	Maxim	10%	Chimac Agriphar	3,5,6-TPA
474	Hormoril 1	0.10%	Achim malshen	Indol butyric acid (IBA)
475	Hormoril 3	0.30%	Achim malshen	Indol butyric acid (IBA)

Source: (General Administration of Pharmacy, 2019).

Annex (8)



Source: (Raosoft, 2004).

Annex (9)

بسم الله الرحمن الرحيم

عزيزي المزارع/ة:

أنا الطالب شاهر الصوص أدرس ماجستير العلوم البيئية في جامعة النجاح الوطنية.

أقوم بعمل دراسة حول: الاستخدام الآمن للمبيدات الزراعية وتطبيق اجراءات السلامة لدى المزارعين في محافظة طولكرم.

إن الهدف من هذه الدراسة هو تقييم مدى المعرفة بالاستخدام الآمن للمبيدات الزراعية وتطبيق اجراءات السلامة لدى المزارعين في محافظة طولكرم وذلك للوصول إلى حل أمثل لتجنب مخاطر المبيدات الزراعية.

لذا أرجو منك الإجابة على أسئلة هذا الاستبيان بعناية واهتمام وذلك للحصول على نتائج دقيقة وواقعية مع العلم أنه لن يتم استخدام البيانات إلا في أغراض البحث العلمي فقط.

أشكر لك حسن تعاونك.

أولاً: الخصائص الاجتماعية للمزارع:

1. **الاسم (اختياري):** .....
2. **الجنس:** ذكر ( )، انثى ( ).
3. **الفئة العمرية:** (اقل من 20)، (من 21-30)، (من 31-40)، (من 41-60)، (أكبر من 61).
4. **الحالة الاجتماعية:** أعزب ( )، متزوج ( )، مطلق ( )، أرمل ( ).
5. **التعليم:** أقل من توجيهي ( )، توجيهي ( )، دبلوم ( )، بكالوريوس ( )، ماجستير ( )، دكتوراه ( ).
6. **العمل الحالي:** حدد مما يلي هل أنت متفرغ لأعمال المزرعة أم يوجد عمل آخر:
   - **6.1 متفرغ لأعمال الزراعة فقط:** نعم ( )، لا ( ).
   - **6.2 موظف (حكومي، قطاع خاص او اهلي او منظمات دولية):** نعم ( )، لا ( ).
   - **6.3 يعمل داخل الخط الاخضر:** نعم ( )، لا ( ).
   - **6.4 عمل خاص آخر:** نعم ( )، لا ( ).
   - **6.5 متقاعد:** نعم ( )، لا ( ).
   - **6.6 ربة منزل:** نعم ( )، لا ( ).
   - **6.7 طالب متفرغ للدراسة:** نعم ( )، لا ( ).
7. **عدد أفراد الأسرة:** (.....).
8. **عدد العاملين منهم في الزراعة:** ذكور عدد (.....)، إناث عدد (.....).

ثانيا: خصائص الأرض الزراعية:

9. **ملكية الأرض:** مالك ( )، مستأجر ( )، ضمانة ( )، محاصصة ( ).
10. **المساحة الكلية للأرض الزراعية:** .....
11. **مساحة الارض الزراعية المستعملة حاليا:** .....
12. **المنطقة:** الشعراوية ( )، الكفريات ( )، وادي الشعير ( )، مدينة طولكرم وضواحيها ( ).
13. **الأرض الزراعية:** مكشوفة ( )، محمية "دفيئات" ( )، مكشوفة ومحمية ( ).
14. **عدد العمال في الأرض الزراعية:** (.....).
15. **هل العمالة الزراعية في المزرعة مدربة ومؤهلة ولديها الخبرة الكافية للعمل في المزرعة:** نعم ( )، لا ( ).
16. **أهم المزروعات التي يتم زراعتها:** .....
.....
17. **هل تواجه مشاكل زراعية؟** نعم ( )، لا ( ).

إذا كانت الإجابة **نعم**، فما هي؟ .....

18. **هل يوجد مكتب خدمات إرشاد زراعي بالمنطقة؟** نعم ( )، لا ( ).

أذا كانت الاجابة نعم:

18.1 هل الارشاد الزراعي المتوفر من خلال الحكومة؟ نعم ( )، لا ( ).
18.2 هل الارشاد الزراعي المتوفر من خلال مؤسسات أهلية؟ نعم ( )، لا ( ).
18.3 هل الارشاد الزراعي المتوفر من خلال قطاع خاص وشركات؟ نعم ( )، لا ( ).
18.4 من خلال مصادر أخرى، حدد .....

19. **هل هنالك مهندس زراعي أو فني زراعي مشرف على المزرعة؟** نعم ( )، لا ( ).

ثالثا: مدى معرفة المزارع بأسس استخدام المبيدات:

20. هل تقوم باستخدام المبيدات في الأرض الزراعية؟ نعم ( )، لا ( ).

إذا كانت الاجابة **نعم،**

20.1.أذكر أسماء المبيدات التي يتم استعمالها غالبا:.....

.....

20.2.**من يقرر استعمال المبيدات؟** الرجل ( )، المرأة ( ).

20.3.**منذ متى وأنت تستخدم المبيدات "الفترة الزمنية":** (.....).

20.4.**هل تقوم باستخدام هذه المبيدات:**

باستمرار ( )، أحياناً ( )، نادرا "في حالات الضرورة" ( ).

21. حسب معرفتك ما هو سبب انتشار المبيدات؟ (من الممكن تحديد أكثر من خيار).

21.1 تأثيرها السريع على الآفات. نعم ( )، لا ( ).

21.2 سهولة الحصول عليها. نعم ( )، لا ( ).

21.3 طريقة الاستعمال البسيطة. نعم ( )، لا ( ).

21.4 سعرها رخيص. نعم ( )، لا ( ).

21.5 غيرها، أذكر .....

22. من خلال السؤال السابق، رتب ـ حسب الأهمية- السبب المباشر لانتشار المبيدات:

أ- .....

ب- .....

ت- .....

ث- .....

ج- .....

23. لماذا تقوم برش المبيدات؟

23.1 وقاية وحماية. نعم ( )، لا ( ).

23.2 ملاحظة الحشرات والأمراض. نعم ( )، لا ( ).

23.3 ملاحظة تلف المحاصيل. نعم ( )، لا ( ).

23.4 توصية من بعض الاشخاص (مثل مزارعين آخرين). نعم ( )، لا ( ).

23.5 بشكل معتاد حسب جدول سنوي لاستعمال المبيدات. نعم ( )، لا ( ).

23.6 توصية عمال الإرشاد. نعم ( )، لا ( ).

23.7 توصية وسائل الاعلام المحلية. نعم ( )، لا ( ).

23.8 غيرها، أذكر .....

24. من خلال السؤال السابق، رتب ـ حسب الأهمية- السبب المباشر لرش المبيدات:

أ- .....

ب- .....

ت- .....

ث- .....

ج- .....

ح- .....

خ- .....

د- .....

25. هل تراعي الظروف الجوية المناسبة (مثل: مراعاة اتجاه الرياح أثناء رش المبيدات) عند استعمال المبيدات؟ نعم ( )، لا ( ).

26. متى يتم الرش؟ في الصباح الباكر ( )، وقت الظهيرة ( )، وقت المساء ( ).

27. هل تعلم كمية المبيدات التي تستخدمها؟ نعم ( )، لا ( ).

إذا كانت الإجابة **نعم**، حدد الكمية التي تستخدمها شهريا: (.....).

28. من الذي يقوم بتحضير المبيدات:

28.1 صاحب المزرعة. نعم ( )، لا ( ).

28.2 المهندس أو الفني الزراعي. نعم ( )، لا ( ).

28.3 العامل الزراعي. نعم ( )، لا ( ).

28.4 غيرها، أذكر .....

29. من يحدد لك المبيد المناسب:

29.1 الأقارب والأصدقاء والجيران والمزارعين الأخرين. نعم ( )، لا ( ).

29.2 الخبرات الشخصية المكتسبة من التعامل مع المبيدات. نعم ( )، لا ( ).

29.3 تجار بيع المبيدات. نعم ( )، لا ( ).

29.3 المرشد الزراعي. نعم ( )، لا ( ).

29.4 غيرها، أذكر .....

30. من يحدد لك جرعة المبيد:

30.1 الأقارب والأصدقاء والجيران والمزارعين الأخرين. نعم ( )، لا ( ).

30.2 الخبرات الشخصية المكتسبة من التعامل مع المبيدات. نعم ( )، لا ( ).

30.3 تجار بيع المبيدات. نعم ( )، لا ( ).

30.4 المرشد الزراعي. نعم ( )، لا ( ).

30.5 غيرها، أذكر .....

31. هل تلتزم بالجرعة الموصي بها؟ نعم ( )، لا ( ).

32. هل تقوم بقراءة المعلومات الواردة على بطاقة المبيد وتتبع التعليمات المكتوبة؟ نعم ( )، لا ( ).

إذا كانت الإجابة **لا**، فلماذا؟ .....

33. هل تقوم برش نوعان أو أكثر من المبيدات المخلوطة؟ نعم ( )، لا ( ).

34. أسباب خلط المبيدات:

34.1 فعالية أعلى لمكافحة الآفات والأمراض. نعم ( )، لا ( ).

34.2 القضاء على العديد من أنواع مختلفة من الآفات في وقت واحد. نعم ( )، لا ( ).

34.3 تقليل تكلفة العمالة. نعم ( )، لا ( ).

34.4 توفير الوقت والجهد. نعم ( )، لا ( ).

34.5 غيرها، أذكر: .....

35. مكان خلط المواد الكيميائية: خارج مكان الاستعمال ( )، داخل مكان الاستعمال ( ).

36. مكان خلط المواد الكيميائية: مغلق ( )، مفتوح جيد التهوية ( ).

37. مصدر المعلومات التي تحصل عليها للتعامل مع المبيد وتطبيقه أو تخزينه والتخلص منه:

37.1 النشرات الإرشادية. نعم ( )، لا ( ).

37.2 بطاقة المبيد. نعم ( )، لا ( ).

37.3 الأقارب والأصدقاء والجيران والمزارعين الأخرين. نعم ( )، لا ( ).

37.4 الخبرات الشخصية المكتسبة من التعامل مع المبيدات. نعم ( )، لا ( ).

37.5 تجار بيع المبيدات. نعم ( )، لا ( ).

37.6 المرشد الزراعي الحكومي. نعم ( )، لا ( ).

37.7 المرشد الزراعي من المؤسسات الغير حكومية. نعم ( )، لا ( ).

37.8 برامج تلفزيونية، اذاعية، صحف، مجلات. نعم ( )، لا ( ).

37.9 غيرها، أذكر .....

38. من خلال السؤال السابق، رتب مصدر المعلومات الذي تلجأ اليه أو تستخدمه بكثرة:

أ- .....
ب- .....
ت- .....
ث- .....
ج- .....
ح- .....
خ- .....
د- .....
ذ- .....
ر- .....

39. هل حدث وتعرض محصولك للضرر بسبب عدم الالتزام بالجرعة المناسبة أو نتيجة لاختيار مبيد غير مناسب؟ نعم ( )، لا ( ).

40. هل تقوم بوضع علامة تحذيرية على الحقل المعامل بالمبيدات أو مكان وجود المبيدات؟
نعم ( )، لا ( ).

41. هل تقوم بالرش في حالات قلة الآفات؟ نعم ( )، لا ( ).

إذا كانت الاجابة **نعم**، حدد السبب: (من الممكن تحديد أكثر من خيار).

- ☐ الوقاية الفعالة العليا.
- ☐ الحد من كثافة الآفات في المحاصيل القادمة.
- ☐ غيرها .....

رابعا: معرفة المزارعين لإجراءات الصحة والسلامة أثناء استخدام المبيدات:

42. هل تلقيت تدريب عن اجراءات السلامة اثناء استخدام المبيدات؟ نعم ( )، لا ( ).

إذا كانت الإجابة **نعم**، حدد من قام بالتدريب: جهة حكومية ( )، مؤسسة خاصة ( )، منظمات غير أهلية ( ).

43. هل تلقيت دورات للتوعية بأخطار المبيدات صحيا وبيئيا؟ نعم ( )، لا ( ).

44. هل تلقيت تدريب حول الإدارة المتكاملة للآفات والتعرف على الحشرات والأمراض والوقاية منها؟
نعم ( )، لا ( ).

45. هل تبحث عن مصادر معلومات لتطوير معرفتك بالمبيدات؟ نعم ( )، لا ( ).

إذا كانت الإجابة **نعم**، أذكر المصادر التي تلجأ اليها: .....

46. هل تسعى لأخذ دورات عن سلامة استخدام المبيدات؟ نعم ( )، لا ( ).

47. هل تهتم بمعرفة حلول مناسبة للحد من الاستخدام المفرط للمبيدات؟ نعم ( )، لا ( ).

48. هل تعتقد أن هناك ضرورة لترشيد استخدام المبيدات؟ نعم ( )، لا ( ).

49. هل تعتقد أن هناك حاجة لإجراء أبحاث علمية تتعلق بمخاطر المبيدات؟ نعم ( )، لا ( ).

50. هل تعتقد أن احتياطات السلامة مفيدة من أجل الحماية من اضرار المبيدات؟ نعم ( )، لا ( ).

51. الإجراءات الوقائية التي تتبعها لاستخدام المبيدات في الحقل:

الاجراء	نهائيا	قليلاً	دائماً
أ- قراءة ملصق المبيد قبل الاستخدام.			
ب- حساب الكمية اللازمة للرش.			
ت- التأكد من تاريخ الصلاحية.			
ث- فحص عينات للحشرات والأمراض قبل استخدام المبيد.			

ج- استخدام معدات الوقاية الشخصية (ملابس خاصة، قفازات وغيرها) عند التعامل مع المبيدات والمواد الكيميائية.			
ح- فحص المعدات الخاصة بالرش قبل استعمال المبيدات.			
خ- استخدام الأيدي للخلط بدون وقاية.			
د- استخدام أدوات مخصصة للخلط.			
ذ- تنظيف أدوات الرش بعد الانتهاء من عملية الرش.			
ر- غسل اليدين بعد استعمال المبيدات.			
ز- تغيير الملابس بعد الرش.			
س- الاستحمام بالماء والصابون بعد الانتهاء من عملية الرش.			
ش- التدخين أثناء التعامل مع المبيدات واستخدامها.			
ص- تناول الطعام أو الشراب أثناء التعامل مع المبيدات واستخدامها.			
ض- السماح بدخول حيوانات المزرعة بعد الرش مباشرة.			
ط- التقيد بفترة الأمان للمبيد.			

52. أي من معدات الوقاية الشخصية تستعملها عندما تقوم بتجهيز أو استخدام المبيد:

المعدات	لا أستخدمها	أستخدمها قليلاً	أستخدمها دائماً
أ- ملابس واقية.			
ب- كفوف (قفازات) لليد.			
ت- طاقية.			
ث- قناع للوجه.			
ج- حذاء خاص.			
ح- نظارات واقية.			

53. إذا كنت لا ترتدي أيٍ من معدات الوقاية الشخصية هل السبب:

53.1 غلاء الملابس الواقية. نعم ( )، لا ( ).

53.2 عدم توفرها. نعم ( )، لا ( ).

53.3 صعوبة الحصول عليها. نعم ( )، لا ( ).

53.4 غيرها، أذكر: .....

54. كيف تقوم بغسل الملابس التي استخدمتها للرش؟ تغسل لوحدها ( )، تغسل مع باقي الملابس في البيت ( )،

خامسا: الآثار الصحية المترتبة على استخدام المبيدات:

55. **هل تعرف أن التعرض للمبيدات له تأثير ضار على الصحة؟** نعم ( )، لا ( ).
56. **هل تعرضت لحالة تسمم أنت أو أبناءك أو أحد العمال الزراعيين في أرضك؟** نعم ( )، لا ( ).
57. **أثناء أو بعد استخدام المبيدات هل شعرت بأي من الاعراض والعلامات التالية:**

الاعراض والعلامات	لم تحدث	أحياناً تحدث	دائماً تحدث
أ- التعرق المفرط.			
ب- الشعور بألم وحكة في العيون.			
ت- جفاف والتهاب الحلق.			
ث- إعياء والتعب العام او الارهاق من أي مجهود.			
ج- دوخة.			
ح- اضطرابات جلدية مثل (احمرار، بقع بيضاء، تقلصات، تقرحات).			
خ- ضعف العضلات.			
د- سيلان الأنف (الرشح).			
ذ- عدم وضوح الرؤية.			
ر- ألم في الصدر.			
ز- مشاكل في التنفس.			
س- السعال.			
ش- كثرة اللعاب.			
ص- الرعاش.			
ض- غثيان أو تقيؤ.			
ط- آلام في المعدة والبطن.			
ظ- إسهال.			

58. **هل تأكدت أن المبيد الذي تستخدمه مصرح استخدامه صحياً؟** نعم ( )، لا ( ).
59. **هل يوجد في المزرعة أدوات للإسعافات الأولية للاستخدام في حالة الإصابات؟** نعم ( )، لا ( ).
60. **في حالة حدوث الاصابة: هل يتوفر مركز علاجي طبي في منطقتك يقوم بالخدمات الطبية للمزارع؟**
نعم ( )، لا ( ).
61. إذا كانت الاجابة **نعم**، هل توجد أي صعوبات في الوصول الى المركز؟ نعم ( )، لا ( ).
حدد ما هي الصعوبات: .....
62. **هل يوجد رقم طوارئ مجاني "لوزارة الصحة" للاتصال عند حدوث سمية المبيدات والاستفسار عن كيفية التعامل معها؟**
نعم ( )، لا ( ).
63. **هل يوجد على عبوة المبيد المستخدم رقم للاتصال عند حدوث سمية المبيدات والاستفسار عن كيفية التعامل معها؟** نعم ( )، لا ( ).

سادساً: تخزين المبيدات:

64. أين تقوم بتخزين المبيدات؟

64.1 في مكان مفتوح. نعم ( )، لا ( ).
64.2 مخزن مخصص للمبيدات. نعم ( )، لا ( ).
64.3 في مكان خاص بالأرض الزراعية. نعم ( )، لا ( ).
64.4 في المنزل. نعم ( )، لا ( ).
64.5 اشتري حسب الاحتياج فقط. نعم ( )، لا ( ).
64.6 غيرها، أذكر .....

65. هل تحفظ المبيد في مكان مظلل وتهوية جيدة؟ نعم ( )، لا ( ).

66. عند التخزين هل تقوم بتصنيف المبيدات حسب درجة خطورتها؟ نعم ( )، لا ( ).

67. ماذا تفعل بعلب المبيدات الفارغة؟

67.1 للاستخدام البيتي "لتخزين المأكولات أو المشروبات". نعم ( )، لا ( ).
67.2 لتخزين نوع اخر من المبيد. نعم ( )، لا ( ).
67.3 رميها في مكب النفايات. نعم ( )، لا ( ).
67.4 رميها بشكل عشوائي في أي مكان. نعم ( )، لا ( ).
67.5 حرقها في الهواء الطلق. نعم ( )، لا ( ).
67.6 دفنها تحت التربة. نعم ( )، لا ( ).
67.7 الاستعانة بوزارة الزراعة للتخلص منها. نعم ( )، لا ( ).
67.8 غيرها، أذكر .....

68. من خلال السؤال السابق، رتب ـ حسب الاكثر استخداماـ الإجراءات المتبعة للتخلص من علب المبيدات الفارغة:

أ- .....
ب- .....
ت- .....
ث- .....
ج- .....
ح- .....
خ- .....
د- .....

69. هل توجد حملات توعية وتثقيف بشأن التخلص الآمن والسليم بيئياً من الحاويات الفارغة للمبيدات الزراعية؟ نعم ( )، لا ( ).

إذا كانت الإجابة **نعم**، حدد من قام بتنفيذ الحملات: جهة حكومية ( )، مؤسسة خاصة ( )، منظمات غير أهلية ( ).

70. كيف يتم التخلص من الكميات المتبقية من المبيدات؟

70.1 استخدام الكميات المشتراة بأكملها. نعم ( )، لا ( ).
70.2 القائها في مياه الصرف الصحي. نعم ( )، لا ( ).
70.3 القائها في أماكن مفتوحة. نعم ( )، لا ( ).
70.4 القائها في أماكن مخصصة. نعم ( )، لا ( ).
70.5 دفنها تحت التربة. نعم ( )، لا ( ).
70.6 رميها في المزرعة. نعم ( )، لا ( ).
70.7 رش المبيدات على ارض غير مستغلة لأي غرض. نعم ( )، لا ( ).
70.8 إعادة الكميات المتبقية لمصدر الشراء .نعم ( )، لا ( ).
70.9 غيرها، أذكر .....

71. **هل تقوم بتخزين الوقود والمواد القابلة للاشتعال بنفس مكان تخزين المبيدات؟** نعم ( )، لا ( ).
72. **هل يوجد مطفأة حريق في مكان تخزين المبيدات؟** نعم ( )، لا ( ).
73. **هل يتم وضع علامات "ممنوع التدخين" بالقرب من اماكن تخزين المبيدات؟** نعم ( )، لا ( ).
74. **هل يتم تخزين المبيدات والمواد الكيميائية بعيدا عن متناول الاطفال؟** نعم ( )، لا ( ).
75. **هل يوجد تهوية جيدة في مكان التخزين؟** نعم ( )، لا ( ).
76. **هل يتم وضع علامة تحذير واضحة على كل حاوية أو وعاء تخزين للتحذير من مخاطر المواد الكيميائية او المبيدات؟** نعم ( )، لا ( ).
77. **هل يوجد مكان مخصص لتخزين المبيدات شديدة الخطورة؟** نعم ( )، لا ( ).

سابعاً: تحديد المزارع للآثار البيئية المترتبة على استخدام للمبيدات:

78. **هل توافق على أن المبيدات تؤثر على التنوع النباتي وتساهم في سمية النباتات والمحاصيل؟** نعم ( )، لا ( ).
79. **هل توافق على أن استخدام المبيدات يؤدى إلى تلوث الهواء بمركبات سامة؟** نعم ( )، لا ( ).
80. **هل توافق على أن عدم الالتزام بفترة الأمان للمبيد يؤدى إلى بقاء بقايا المبيد في الخضروات والفواكه؟** نعم ( )، لا ( ).
81. **هل توافق على أن استخدام المبيدات بكميات كبيرة يؤدي إلى القضاء على الكائنات الحية في التربة؟** نعم ( )، لا ( ).
82. **هل توافق على أن المبيدات تساهم في تلوث التربة لفترات طويلة وتقلل من خصوبتها؟** نعم ( )، لا ( ).
83. **هل تعلم أن المبيدات تؤثر على توازن الحشرات والملقحات الطبيعية؟** نعم ( )، لا ( ).
84. **هل تعلم أن المبيدات تؤثر على الحيوانات؟** نعم ( )، لا ( ).
85. **هل حدثت أضرار لحيوانات مزرعتك نتيجة تعرضها للمبيدات أو تناولها نباتات مرشوشة بالمبيدات؟**

إذا كانت الإجابة **نعم**، ما هي الأضرار: .....

86. **من وجهة نظرك ما هي العقبات التي تواجه المزارع في محافظة طولكرم؟**

.....
.....
.....
.....
.....
.....

87. **ما هي مقترحاتك للتقليل من مخاطر المبيدات على المزارعين في محافظة طولكرم؟**

.....
.....
.....
.....
.....
.....

Annex (10)

	Expert	**Qualification**
1	Dr. Abdel Fattah Hasan	PhD in Civil and Environmental Engineering.
2	Dr. Tawfiq Qubbaj	PhD in plant physiology & biotechnology.
3	Dr. Hafez Shaheen	PhD. in Hydrology and Water Resources Management.
4	Dr. Yamen Hamdan	Ph.D. in Genetic Engineering and Plant Biotechnology.
5	Dr. Iyad Abdel Afou Badran	Ph D. in Animal Science.
6	Fadi Esleem	Master in Environmental Health.
7	Sami Mosa	Master in Plant Production.

Annex (11)

Map Key:

- **Al Sha'rawiya.**
- **Tulkarem city and its suburbs.**
- **Wadi Alshaeir.**
- **Al-Kafriyat.**

Note that this study included 94 participants (26.86%) from Al Sha'rawiya, 80 participants (22.86%) from Al-Kafriyat; 93 participants (26.57%) from Wadi Alshaeir, and 83 participants (23.71%) from Tulkarem city and its suburbs.

جامعة النجاح الوطنية
كلية الدراسات العليا

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قدمت هذه الأطروحة استكمالا لمتطلبات درجة الماجستير في العلوم البيئية بكلية الدراسات العليا في جامعة النجاح الوطنية في نابلس، فلسطين.

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الملخص

أدى الاستخدام المكثف للمبيدات الزراعية إلى مشاكل عديدة حول العالم. تهدف الدراسة إلى تقييم معرفة المزارعين بالمبيدات الزراعية وتطبيقهم لإجراءات السلامة في محافظة طولكرم.

أجريت دراسة وصفية لتقييم معرفة المبيدات الزراعية وتطبيق إجراءات السلامة بين المزارعين في محافظة طولكرم. تكونت عينة الدراسة من 350 مشاركاً. كل المشاركين قاموا بتعبئة الاستبانة، وكان معدل استجابة المشاركين للاستبانة 100%.

أظهرت نتائج الدراسة أن المشاركين الذكور (عددهم = 79%) أعلى من الإناث 21%). وواجه 71.1% مشاركاً مشاكل زراعية؛ حيث كانت أعلى نسبة لهذه المشاك الزراعية هي مشكلة أمراض المحاصيل المختلفة. استخدم 96٪ من المشاركين المبيدات الزراعية في أراضيهم الزراعية؛ وكان النوع الأكثر استخدامًا من هذه المبيدات هو الكونفيدور. إلتزم 91.1% مشاركا بالجرعة الموصى بها من المبيدات الزراعية. كما كان 83% مشاركًا يقرأون المعلومات الموجودة على بطاقة المبيدات ويتبعوا التعليمات المكتوبة. 59.1% مشاركين لم يتم تدريبهم على تدابير السلامة. كما لم يحضر 56.9% مشاركا دورات لزيادة الوعي حول مخاطر المبيدات. وبنفس الطريقة، لم يتم تدريب 62.6% مشاركًا على الإدارة المتكاملة للآفات وتحديد الحشرات والأمراض والوقاية منها. بالإضافة إلى ذلك، بحث 72.3% مشاركًا عن مصادر المعلومات لتطوير معرفتهم حول المبيدات الزراعية. علاوة على ذلك، سعى 72% مشاركًا إلى أخذ دورات حول الاستخدام الآمن للمبيدات الزراعية. وأخيرا كان 85.1% مشاركًا مهتمين بمعرفة الحلول المناسبة للحد من الاستخدام المفرط للمبيدات الزراعية.

أظهرت النتائج وجود فروق ذات دلالة إحصائية بين الموقع الجغرافي واستخدام المبيدات الزراعية في الأراضي الزراعية. معرفة كمية المبيدات المستخدمة؛ الالتزام بالجرعة الموصى بها؛ وضع علامة تحذيرية على الحقل الذي يرش بالمبيدات أو حيث توجد المبيدات؛ حساب الكمية المطلوبة للرش؛ التحقق من معدات الرش قبل استخدام المبيدات الزراعية؛ واستخدام أدوات الخلط المخصصة. أيضا، كانت هناك فروق ذات دلالة إحصائية بين مستوى التعليم وقراءة المعلومات على بطاقة المبيدات واتباع التعليمات المكتوبة؛ قراءة ملصق المبيدات قبل الاستخدام؛ حساب الكمية المطلوبة للرش؛ التأكد من تاريخ انتهاء الصلاحية؛ تنظيف أدوات الرش بعد الانتهاء من عملية الرش؛ غسل اليدين بعد استخدام المبيدات الزراعية؛ وتغيير الملابس بعد الرش. بالإضافة إلى ذلك، كانت هناك فروق ذات دلالة إحصائية بين عمر المزارع واستخدام اليدين للخلط دون أدوات حماية. علاوة على ذلك، كانت هناك فروق ذات دلالة إحصائية بين الجنس ووضع علامة تحذير في مكان رش المبيدات أو حيث توجد المبيدات. استخدام معدات الوقاية الشخصية عند التعامل مع المبيدات الزراعية والمواد الكيميائية؛ واستخدام اليدين لخلط المبيدات دون حماية. علاوة على ذلك، كانت هناك فروق ذات دلالة إحصائية بين التدريب الذي تقدمه المنظمات الحكومية ووضع علامة تحذير في مكان رش المبيدات أو حيث توجد المبيدات. استخدام معدات الوقاية الشخصية عند التعامل مع المبيدات الزراعية والمواد الكيميائية؛ واستخدام اليدين لخلط المبيدات دون أدوات حماية. بالإضافة إلى وجود فروق ذات دلالة إحصائية بين التدريب الذي تقدمه المنظمات غير الحكومية وفحص عينات الحشرات والأمراض قبل استخدام المبيدات. استخدام معدات الوقاية الشخصية عند التعامل مع المبيدات الزراعية والمواد الكيميائية؛ والالتزام بفترة الأمان قبل الحصاد.

الكلمات المفتاحية: الزراعة، المبيدات، إجراءات السلامة، معدات الوقاية الشخصية، المزارعين، محافظة طولكرم.